

The Iron Age

A Review of the Hardware and Metal Trades.

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Large Drawing Press.

The press which we illustrate upon this page is intended for use in the manufacture of the so-called stamped goods. In this country, however, the name of stamped ware, or stamped goods, is hardly appropriate, as in most cases the drop has given way to the press. This press may be taken as an example of the very latest and best American practice, and embodies many improvements which largely reduce the expense of producing a given quantity of goods. The length over all is 15 feet, the width 6 feet, and the height 11 feet; the weight, complete, is 36,000 pounds. As will be noticed from a glance at the cut, the press stands upon six legs, which might be, if necessary, removed, thus reducing somewhat the height of the machine, but as these give facility for access to all parts, they are best retained. The blank holder has a motion of 13 inches and the punch 15 inches. It will receive a blank 34 inches in diameter. The gearing is in the ratio of 29 to one.

It is designed for drawing large dish pans, sauce pans, and similar kinds of large and deep pressed ware. When driven at a speed of eight strokes per minute, it will carry down two No. 7 dish pans at a time. In the ordinary methods of drawing, it is not desirable to carry a blank down more than $4\frac{1}{2}$ inches at a time, then the dish is removed and spun to take out the wrinkles, and the flange is turned up. The spinning hardens the metal and makes it more likely to crack, and turning up the flange is a useless operation, as it must be turned back in wiring. This press, by reason of its elasticity, draws down so perfectly, that spinning as an intermediate operation is not needed. The blank holder holds the flange at both operations. After taking the pan down $4\frac{1}{2}$ inches it is merely necessary to put in another punch in order to take it down the remainder of the distance. This makes a saving of one-third of the number of operations, and much more in time, since spinning is a much slower operation than stamping, and two or more extra handlings are involved in finishing the blanks, etc. The usual necessity of assorting the plates is avoided by the use of levers which spring or "give" slightly, and allows the blank holder to yield sufficiently to admit the different thicknesses without difficulty. Breakage is, of course, greatly reduced on account of this elasticity.

The press is driven by means of a friction clutch of a pattern which has given remarkably good satisfaction wherever used, and is generally considered, we think, one of the best in the market. The press can be stopped and started almost instantaneously by means of it. Judging from appearances, and the way in which the power is applied in doing the work, we should say that very little power is required for doing the work—less, probably, than in the common form of large presses. The press is, as it were, perfectly self-contained; its own bed-plate is so strong and so rigidly trussed that a special foundation is not required for it. We have seen one of them at work upon an ordinary solid floor, and should think that a strong floor could safely carry one of them. It will be noticed that the strains are almost entirely taken by the 3 inch iron rods at the sides of the bed plate. In addition to these, there are four $2\frac{1}{2}$ rods passing from the bed-plate to saddles on the shaft which carries the punch lever. These rods take the strain when the dies come home, entirely relieving the bed-plate. The rods which carry the blank holder are of steel, as well as that which holds the punch. All the pins and the two shafts on the extreme left are of machinery steel. The shaft on which the levers are hung and the shaft which carries the cams are both of iron six

inches in diameter. The bolts going through the bed-plate are turned to fit the holes, and driven in the holes being carefully reamed out to secure them. The bearings are all lined with composition metal of copper and tin. The press is very substantial, is fitted up in a first-class manner, and will save much time and labor in the production of heavy goods. It is manufactured by Messrs. Bliss & Williams, 167 to 173 Plymouth street, Brooklyn, N. Y.

Materials for the Government Commission on Tests of Iron and Steel.

We commend the following to all who are interested in promoting the success of the important work to be undertaken by the United States Commission appointed to test iron, steel, etc.

STEVENS INSTITUTE OF TECHNOLOGY,
DEPARTMENT OF ENGINEERING,
HOBOKEN, N. J., May, 1875.

The United States Board to test iron, steel, etc., appointed by the President of the United States, in accordance with Section 4 of the Act of Congress, making appropriations for sundry civil expenses of the government, and approved March 3, 1875, has assumed, as a part of its work, the investigation of the methods and effects of abrasion and wear of metals in engineering and mechanical operations.

This committee is instructed to take up this subject and to report such valuable data and statistics, and such information as it may acquire by experiment or from other observers, in such form that it may be readily collated and made useful to the government, the public, and the engineering profession.

The committee would be pleased to receive

minimum and the mean weight sustained, and velocity of rubbing or number of revolutions per minute should be given. The nature of the lubricant is an essential element, and its composition should be stated, the method and frequency of application and the quantity used should be given. When known, or readily ascertained, the coefficient of friction should be given. It should also be noted whether heating occurs, and under what circumstances of pressure and velocity of rubbing surfaces.

Peculiar instances of the behavior, or unusual expedients in the management of, bearings, if described accurately and concisely, will be accepted, with thanks.

The wear of tools, under the various conditions of workshop practice, is another subject of investigation.

Weighing the tools carefully before and after

managers of the company have been steadily pressing, has been so nearly attained that it demands recognition from foreign experts, who are generally considered as prejudiced or partial to old established methods. A full translation of the notes received would make too long a notice, but a few phrases will show the estimation in which the workmanship of this Hartford company is held abroad. Government agents, acting as inspectors, testify that "the tools, machinery, gauges, etc., were not only made with nicety, thoroughness, correctness and of good material, but their capacity responds to the requirements as to quality and quantity, and that the system on which the tools are founded makes the business independent, in no small degree, of the skill and dexterity of the workmen, and secures a saving in the cost amounting in the production of some of the parts to one-half of the wages paid for labor." In closing, the report from which this quotation is made, says: "It is particularly noticed that the company has met all the demands and desires expressed by the government in the course of our business relations in the most accommodating manner, showing its members as worthy of respect and esteem, and its management as conducted on correct business principles."

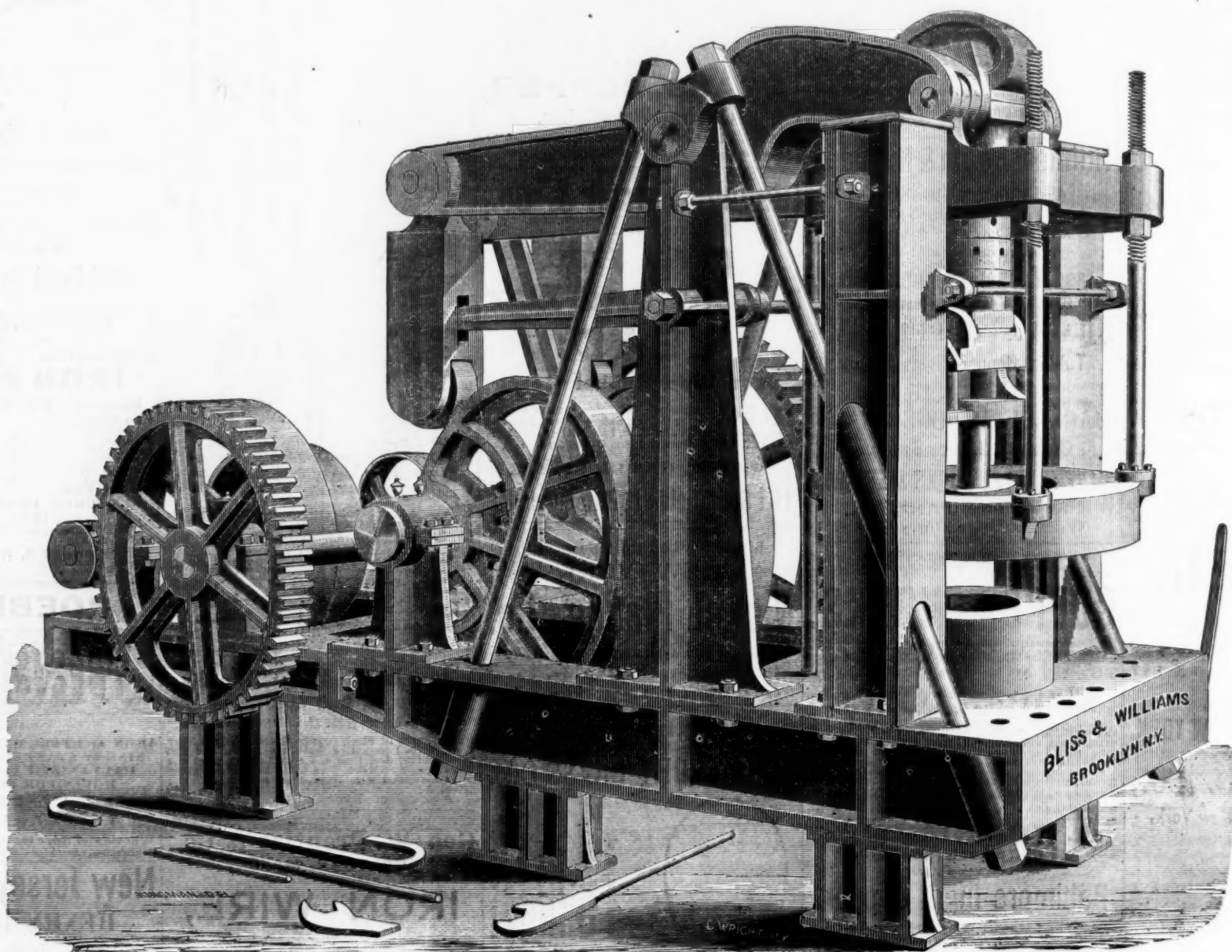
These testimonials are from the authorized agents of the Prussian government, for which the Pratt & Whitney Company have built machinery and furnished tools used in its three great national armories, the value of the machinery furnished by this firm to this one government amounting in the aggregate to twelve hundred and eighty thousand dollars. The company have also furnished large amounts to other governments. Mr. Pratt has already sent some orders from abroad, and there are encouraging prospects of further considerable orders which will tax the capacities of the concern of which he is president.

The railroad strikers in the vicinity of Pottsville are asking for work in large numbers. One entire section of the order has made such application to the company, and the indications are all in the direction of an early abandonment of the movement. With the disaffection

and differences already existing among the miners in regard to the strike, the action of the railroad men may be reasonably expected to have its influence in bringing about the much-to-be desired termination of the labor troubles in the coal region that have yielded nothing so far, and promise nothing in the future but disaster to all concerned.

The Harrisburg Patriot of the 10th inst. says: The Pennsylvania Steel Company has increased the capacity of the works at Baldwin so largely that now about 1000 tons of rails are manufactured weekly, over twice as much as at the corresponding period last year. The two furnaces being erected, in addition to the one in operation, will not be able to furnish the necessary pig iron, about 200 tons being used up daily. Of anthracite coal from 90 to 100 tons are consumed at the steel works per day. Recently a cargo of 500 tons of steel rails was shipped. Twelve new brick houses (possibly twenty), of handsome design, will be erected during the summer for the accommodation of the superintendents and other employees of the steel works. The cellars for a number have already been dug.

Zanesville's annual glass manufacture is summarized as follows: Raw material—coal, 322,000 bushels; soda ash, 700 tons; lime, 17,000 bushels; sandstone, 3900 tons; wood, 500 cords; lumber, 1,000,000 feet; nails, 300 kegs; Missouri clay, 40 tons; straw, 250 tons. Production—135 boxes daily of window glass; 300 boxes daily of various kinds; number of employees, 230.



LARGE DRAWING PRESS, BY MESSRS. BLISS & WILLIAMS.

STEVENS INSTITUTE OF TECHNOLOGY,
DEPARTMENT OF ENGINEERING,
HOBOKEN, N. J., May, 1875.

To the Editor of The Iron Age: DEAR SIR: The Commission appointed by the President of the United States to experiment and report upon the metals used in construction, desires to secure the assistance of all who are interested in this great work, and through them to obtain all information available as the result of the labors of earlier, or of contemporaneous, investigators and observers.

I take the liberty of enclosing herewith circulars indicating the scope of the labors undertaken by this Commission, and beg that you will aid, by such methods as may be by you deemed best, in the collection of all information which may be accessible, relating to either the general work of the Commission or to the special subjects assigned to its committees.

Data collected in the course of ordinary business practice, and the records of special researches previously made or now in progress, are particularly desired.

It is expected that the Commission will receive valuable information and useful suggestions, both from business men and from men of science, and it is hoped that the work undertaken as here indicated may be supplemented by original investigations made by both these classes.

The national importance of this work justifies the expectation of an earnest and effective co-operation. Very respectfully, yours,
R. H. THURSTON, Sec.

from any reliable source such precise data and such information as may enable the secretary to compile, in as concise and exact form as possible, a statement of the mode of deformation, the rapidity of abrasion and the laws governing wear in any important typical or exceptional cases.

The executive officers of all lines of railway may render valuable aid by furnishing statements of the wear of rails per ton of transportation, specifying with care the original weight, the make, and the character of the rail, the total amount of transportation, the length of time occupied, and stating whether the rail finally broke or was removed. Specimens of rails remarkable either for endurance or for a lack of this quality, if sent to the committee, will be of use in assisting in the determination of the chemical and other properties which most affect the value of the material under the stated conditions of use.

Similar statistics and information in regard to the wear of wheels, axles and other parts of rolling stock and machinery will be equally valuable.

Engineers having in any instance noted and accurately recorded such data, are requested to transmit to this committee copies of their memoranda.

The wear of journals under heavy loads, or at high velocities, as well as under ordinary conditions, is an important branch of this subject. When possible it is desired that the dimensions of the journal, the maximum, the

use, and weighing the amount of metal removed will, perhaps, be found the most accurate method of determining the rate of abrasion. The area of surface finished, and the area of the surface cut by the tool, should be accurately ascertained and stated.

The description of the tools, its shape, method of operation, the kind of metal used in the tool, the temper adopted, the character of the metal cut by it, the velocity of the tool, and where peculiarities of behavior were noted, a careful statement of them should be given. This information will still be more valuable if the tool itself and specimens of the chips produced by it are furnished.

The power required to drive the tool can sometimes be readily determined, and such information is of great value.

The recent investigations of M. Tresca—*Memoir sur le Robotage des Metaux*, etc.—is an excellent example of such research.

For all information which may properly fall within the limits of their investigation, this committee will return suitable acknowledgments.

R. H. THURSTON, Chairman.

American Machinery and Tools in Prussia.

The Hartford Courant says: Mr. F. A. Pratt, president of the Pratt & Whitney Company, writes from Berlin by the last mail, and incloses certificates from government agents which are of the most flattering character. They show that the perfection of work, toward which the

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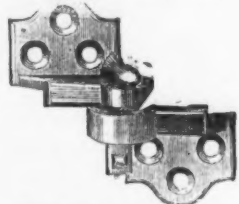
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British Commerce in Iron and Steel.

The London *Mining Journal* says: The public press has been much occupied with expressions of regret and disappointment at the alleged decline of our iron trade. It is, therefore, appropriate to place before those interested in foundries and iron and coal mines authentic and reliable data showing the true condition of affairs. Our iron and the coal essential to work it have been the main basis of our manufacturing and economical prosperity, and must be so, for, as a very distinguished miner remarked in the *Mining Journal* some seven years ago, iron is the backbone of the world. When, some time ago, a great assemblage took place at Barrow-in-Furness, in Lancashire, in connection with its new iron industry, Mr. Gladstone said, "King Cotton has won great fame, but King Iron is the greater." Indeed, without the iron cotton could never assume its useful forms. Subjoined is an examination of this trade for the last month, and the last quarter. The imports of iron and steel for the month last past were as follows: Bar iron, £42,000 (giving round numbers only), a large increase upon 1873, but a decrease of £5000 upon 1874; iron manufactures, £110,000, against £103,000 last March twelvemonth, and £83,000 the March before that; steel unwrought, £8000, as compared with £12,000 March 1874, and £15,000 in the same month 1873. During the first quarter of the year bar iron imported was valued at £296,000, against £277,600 the first quarter of 1874, £228,000 the first quarter of 1873. Unwrought steel was imported during the quarter which has just expired to the value of £20,000, against £18,000 during the first three months of 1874, and £28,000 in the corresponding period of 1873. Thus, about £427,000 worth of iron and steel has been imported in the quarter ending March 31, being much in excess of 1873, but considerably under 1874, as the above figures show. The bar iron was almost exclusively imported from Belgium, and very exaggerated reports were raised as to its quantity; the steel came chiefly from Sweden, and the wrought, to some extent, from Belgium, but mostly the tasteful iron manufactures were from Germany. Pyrites of iron were also imported, but their quantity is not distinguished from other pyrites. The quarter's value upon them all may, therefore, be taken, and their declared value was no less than £377,000, an increase of £41,000 over 1874, and about £110,000 over the same period in 1873.

England is accustomed to re-export—as the phrase is—the foreign iron for a time stored here. Last quarter iron bars of this order were sent away again to the amount of £95,000, about one-third of all received; and of unwrought steel, £3000—not far from three-fourths of all received.

The exports of British iron and steel assumed various forms, which we shall state *seriatim* according to the order observed in the report of the Board of Trade. In most cases the statistics of the month are given, as well as of the quarter, that the reader may measure the recession or advance, as the case may be, of the different departments of this great product, manufacture and merchandise.

Of pig iron the exports for the quarter were valued at £815,000, and in the corresponding period of 1873 twice as much as in the first quarter of its predecessor, so that from Jan. 1, 1873, comparing the opening quarters of the year only, this branch of the iron trade has fallen as low as one-third of what it was in the initial quarter of the year just named. Probably this is the heaviest decline ever recorded in any branch of British industry during similarly corresponding periods. Unfortunately, the falling off proportionately for the month continued, showing that there has been no noticeable improvement. The exports last month were £237,000, against £303,000 the same month in 1874, and £704,000 corresponding month of 1873.

It appears that our customer for pig iron during the three months which have just transpired were principally Holland, which took about one-fourth of the whole. The Dutch nation has no iron, and it appears that they prefer a resort to England rather than to the neighboring country—Belgium. In fact, Holland is one of the best customers the United Kingdom possesses, not only for iron, but generally. Germany took within £24,000 of Holland, although it is not difficult to remember an alarmist cry that Germany was beating us in our own market. Precisely the same may be said of Belgium, which uses large quantities of English and Scotch iron, both for home uses and export. The Belgians within £11,000 as much as Holland. The only other large customer in this department was France. Bar, angle, bolt and rod form another important and distinct department of the iron trade. The quarter's exports were valued at £204,000, against £707,000 last year in the same period, and £873,000 the year before. This is a very serious decline, but bears no comparison with the fall in pig iron.

The decline on the three corresponding months has, as in the case of the first named branch of the trade, been proportionate. For last month the exported values were £224,000, for that with which it is immediately compared £276,000, and for that with which it is a little more remotely compared close upon £366,000. Our best customer in this department was British India, which took closely upon one-fifth of the whole. There was no very large customer beside, but a fair distribution nearly over the whole world—Russia, Germany, France, Holland, Italy, Turkey, United States, British North America, Australia, and, under the curious heading of "other countries," which conducts us nowhere, there is placed the large proportionate item of £224,000. And yet, notwithstanding the wide range of this branch of iron manufacture, it is obviously declining.

Another important branch of the iron trade is that of rails, or rather "railway iron of all kinds." In this department our commerce covers a greater geographical range than any other; there is no climate, no zone, no region of the world to which we do not send "railway iron" and rails—Russia, Sweden, Norway, Denmark, Germany, Holland, Belgium, France, the nations that skirt the Mediterranean, the Atlantic on both sides, the Indian Ocean and the Pacific. Our exports for the quarter were of the value of £1,057,000, not quite half what it was in the corresponding months of 1874, and £750,000 less than in those of 1873. For the month the decline has even been greater—the value for March was £219,000, it was £223,000 the March before, and £386,000 the March before that. This department of the iron trade is likely to be the first to rally. Many countries are held back by the general stagnation of commerce and want of financial resources. Russia has not over one-third accomplished her railway projects; Turkey and Egypt are very inadequately provided; China and Japan have to begin the work, at least in the instance of the former country, and virtually in both; Brazil requires lines to open up her interior provinces, &c. Our chief customers are likely to be Australia, India and Russia for some time to come, for they are sure to look to this country for their supplies. Another class of articles in the export iron trade, comprises "hoops, sheets and boiler and armor plates." The quarter's value was £737,010—here at last we have a decided advance on the corresponding period of 1874, when the values were only £608,424, but the opening three months of the previous year, showed a far higher trade than either, being represented by £878,925. A comparison of the month of March in those years respectively bears the same relative proportion, showing that after a most serious falling off in this branch of the trade in 1874 an improvement of a promising nature has been established. India and Australia have been to a very large degree our best customers both for the month and the whole three months.

What are called tin-plates constitute a very important branch of the iron trade. The exports for the last quarter were valued at over a million, a little more than in 1874, and a little less than in 1873. The business done in the month, however, while proportionate to that of 1873, shows, as in the instance of the department previously referred to, a very satisfactory increase. The United States took for the quarter four-fifths of the whole, and for the month about three-fourths, and is, in fact, the only very large customer.

The other branches of the purely iron trade in the statistical arrangement of the Custom House are the export of old iron to the United States for remanufacture, and which is too trivial to furnish details of interest, and such exports as are classed under the extensive heading of "cast, or wrought, and all other manufactures except ordnance not enumerated." The values in this department were £906,370, against £1,096,491 in the same quarter 1874, and £1,155,439 in 1873. The proportions for the March of each year show the falling off to have been more severe; Australia and India received most of this more general branch of the manufacture, and both purchased augmented amounts both on the quarter and on the month.

Our export of steel, unwrought, was chiefly to the United States, the trade with which in this respect has fallen off both on the month and quarter. The total value of this export was for the latter £234,200, against £288,031 the year before, and £336,591 the year before that. Manufactured steel, or steel and iron combined, was of the declared value of £178,000 for the quarter. This is not an extensive export, and the trade is a slightly improving one.

The total value of all the articles of this great commerce was for the quarter £5,608,368, against £7,021,345 in the corresponding quarter of 1874, and £8,378,981 in that of 1873—a serious decline. It is, however, an encouraging fact that quantities did not decline in proportion to value; the trade, therefore, did not diminish so much as declared value would imply. This arose from the inflated prices of 1873 and 1874, and the rapid decline in prices during the latter year.

These statistics do not show our whole trade in iron and steel; cutlery, hardware, steam engines, machinery, fire arms, &c., are mainly composed of these elements, and their united values display a trade of vast magnitude, and, we may add, great magnificence. It would, however, be impossible in a single article to state and discuss the condition of the various manufactures into which iron and steel largely enter; the observations must, therefore, be confined here to the trade in the direct and specific manufactures of iron and steel.

Prices of Works of Ancient Art.—While large prices are paid for modern works of art, still greater sums were paid in ancient times, as is seen by the following examples: Zeuxis grew so rich that he refused to sell more pictures, and gave them away to cities, and Nicias declined an offer from Attalus of £15,000 for a single picture. Appelles received £12,500 for a portrait of Alexander, and gave £12,500 for each picture Protogenes had in his studio. Julius Cæsar gave £20,000 for two pictures of single figures, one Ajax and the other Medea; and M. Agrippa paid to the municipality of Cyzicus £10,000 for two more. Lucius Mummius refused £52,000 for a picture of "Father Bacchus," which he had seized in Greece, and Tiberius gave 60,000 sesteria, or nearly half a million, for a picture by Parrhasius. Cicero argued that Verres had compelled Helius, a rich Sicilian, to part with a little bronze Cupid by Praxiteles, because Verres bought it for only £1003; and Nicomedes offered to pay off the public debt of Cnidus—quod erat agendum, says Piny—if the citizens would give him Praxiteles' statue of Venus in return, and was refused because it was the glory of the city.

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enable them to offer Rails, when quality is con-
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of the Company, and the enviable reputation
they have established for "CAMBRIA RAILS,"
are deemed a sufficient guarantee that purchasers can
at all times depend upon receiving rails unsurpassed
for strength and wear by any others of American or
foreign make. Any of the usual patterns of rails
can be supplied on short notice, and new patterns of
desirable weight or design will be made to order.
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the trade, has lately
been materially im-
proved, and is now pre-
sented as a perfect ma-
chine; working in A,
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tin, sheet iron and cop-
per, straight, herring
and oval work, such as
boilers, coffee pots, &c.
It is the only machine
in use that double seams
and sets down without
changing the work. Its
weight is 100 lbs. and
its dies and setting down
wheel are made of cast
steel. The entire machine
and attachments are con-
structed on a principle
that secures its satisfac-
tory operation. It is
warranted. No Tinner can
afford to be without it.
Price \$30. See advertisement
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Set Iron Dogs, 1/2 to 2 in. \$ 5 00
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Orders solicited from all parts of the country

Iron Making in the South—Hot Blast Charcoal Stacks.

CARTERSVILLE, BARTOW COUNTY, GA., May 25.

To the Editor of The Iron Age: Before pro-
ceeding to enumerate the hot blast charcoal
furnaces, and discuss their characteristics, I
shall state some points which have been sug-
gested as to coke: First, I am asked what are
the possibilities of cheaper coke? With the
completion of the Cincinnati Southern Road
good coke can be delivered in Chattanooga
with fair profit for 8 cents, and to the Bartow
(not Barton) furnace for 9 cents per bushel.

It is probable, also, that Suwanee will improve
the quality of its coke, and also cheapen the
cost, and the Dade mines will also enter the
market in the future, as they get their mine
more fully opened. Again, the Alabama and
Chattanooga Railroad is now owned by Mr. J.
C. Stanton, and will be run regularly. Its line
abounds in coal, but the value for iron making
is yet to be practically tested in the furnace.

There are numerous points on its line where
coke should be delivered at a cost of not over
5 cents per bushel. Again, at no very distant
day, the railroad now running from this place to
the slate quarries, at Rockmart, will be con-
tinued to the A. & C. R. R. and tap the Alabama
coal fields. This will allow coal and coke to
be delivered at this point for one to one and a
half cents per bushel, say, 8 cents in all. Here
it would meet cheap and rich iron ore, and be
on a great line of transportation. Second, I am
asked as to the yield of the furnaces named:

Oakdale was run only twenty days by Mr. Bram-
well, and then on short allowance of ore and
coke, with poor quality of the latter, and 20
tons per day was made, nearly all extra No. 1
foundry iron. Chattanooga furnace had not
yet to running full before the flood, but had
made 20 to 22 tons. Bartow will average 22
tons this blast—it has made 25 tons. Third, as
to my cost of labor: Oakdale can only be es-
timated, as it was never run regularly, but with a
product of 25 tons per day, and without high
salaried fancy officers, \$3 per ton would cover
the labor item. Chattanooga furnace has some
salaried officers—none high though—and has
other labor expenses not incident to a furnace
near its ore and coal; \$5 per ton on 20 tons per
day should cover all. Bartow is run more
cheaply than either of the others, the superin-
tendent being the only person receiving much
of a salary, and he only \$2500. Common labor
is never over \$1 per day. Fourth, as to whence
came the capital to build these furnaces: Oak-
dale was from New York and Hartford. The
Roane Iron Company has its stockholders in
New York, Ohio, Indiana and Chattanooga;
the last came originally from the West. The
Chattanooga furnace is chiefly Minnesota capi-
tal. Bartow is Georgian, a small part origi-
nally from Pennsylvania.

The chief seat of hot blast charcoal iron ma-
nufacture in the South is on the line of the Selma,
Rome and Dalton Railroad. On this road there
are five strictly hot blast, three which claim
only warm blast, and one strictly cold blast.

The hot blast are Tecumseh, Stonewall, Rock
Run, Woodstock and Alabama. The warm
blast, Ridge Valley, Etna and Shelby. The
strictly cold blast, Bibb furnace, near Brierfield.

Tecumseh is a well built stack 62 feet high,
14 feet bosh, and has excellent machinery fit-
tings, the blast engine being one of Ainslie,
Cochran & Co.'s vertical, has steam cylinder
48 by 36 inches, and blast cylinder 48 by 84
inches, and is a first-class machine. The fur-
nace has never done well, not having averaged
over 14 tons per day. The ore is brown hematite
of good quality. Was about to go out of
blast when I last heard from there, and would
make some change in stack or run on coke
hereafter. Ore is abundant; location one
mile from railroad, and is connected by a
branch road. The trouble is in the construc-
tion of the stack, as Gen. Warner is considered
a good manager. The greater part of the
charcoal used in the furnace has been made in
ovens of the beehive pattern. The capital is
chiefly from the North and West. It is hardly
necessary to state anything of cost of product
as the furnace has been a failure.

Stonewall furnace is directly on the railroad.
The stack is 40 feet high and 11 feet bosh,
base brick, then straight iron shells. It has
been as successful as any hot blast furnace in
the South. It has never run on Sundays. In
a blast of 13 months stopped two weeks for
supply of coal, and averaged 18 tons per day of
excellent iron, much the largest proportion
foundry, and at a cost of about \$19 per ton.

The blast engine is one of Ainslie, Cochran &
Co.'s 3 cylinder horizontal, and is a very ex-
cellent machine. The engineer said it had not
been stopped for any repairs in the 13 months.

The capital of the company is almost entirely
Georgian, with office in Rome, and they have
lately reduced the stock to \$80,000. The
furnace is well managed by Capt. Wurtz, and
he says he has now found where the leaks are,
and in starting again will be able to make iron
more cheaply; not now in blast. If any furnace
can make hot blast iron at a profit it should be
this one. Uses pit charcoal, and ore is limonite.

Rock Run is a small furnace, calculated for
12 tons of pig per day; is located near three
miles from the road, near ore and timber; made
only a short blast in 1874, and had to stop for
want of money, being also badly in debt. Blast
engines are horizontal, being second-hand, re-
fitted. They made a good quality and quantity
of iron. Charcoal made in pits.

Woodstock furnace is at Anniston station,
directly on the railroad. The stack is 40 feet
high, with 11 feet bosh, and makes an average
of 18 tons of iron per day. The blast engine
is vertical, made by Noble Brothers, Rome,
Ga. The steam cylinder is 48 by 30 inches, and
the blast cylinder 48 by 72 inches. Ore, limonite,
from several banks. Charcoal made in
pits. Capital is partly Georgian and part North-
ern or Scotch. It is well managed, and has
abundant capital. Cost of iron per ton about \$19.

Alabama furnace is also directly on the rail-
road. The stack is 40 feet high, and bosh 9
feet. It has for many months past made over
20 tons per day, but the quality is not so good
as either Stonewall or Woodstock. The blast
engine is one of Ainslie, Cochran & Co.'s three
cylinder horizontal, same as Stonewall. Ore,
limonite, near the furnace. The capital in this
furnace is, I am informed, all Southern. Cost
of iron about \$17. Charcoal from pits and
limonite for ore.

Of these five furnaces all but Tecumseh are
side hill, all but Tecumseh use pit coal, and all
use the same character of ore. Generally
speaking, the pit coal is estimated to cost 8
cents per bushel in the stock house, but in-
cluding waste and careless measurement, proba-
bly has cost not less than 10 cents by the time
it went into the furnace.

Capt. Wurtz, admitting these facts, thinks
that, with decreased price of labor and experi-
ence of the past, he will hereafter be able to
put charcoal in the Stonewall stack at not over
6 cents per bushel. Naturally, the cost of char-
coal should be increasing as the distance of the
timber is on the increase, as any of these fur-
naces will use the timber from 300 acres annu-
ally. It is seen that the Alabama is calculated
to make iron cheaper than the others, but the
quality is perhaps proportionably inferior, as a
hotter blast is used. The consumption of char-
coal at all but Tecumseh may be safely placed
at 120 bushels, though some claim to make a
ton with 110. Placing this at 10 cents, and we
have \$12 for coal; limestone, 50 cents to \$1 per
ton of pig; ore, \$3, though some can deliver
more cheaply; labor at \$4 to \$5. My figures
are of the past. Hence we have about \$19-50
as the cost of a ton of pig at the furnace, with-
out counting interest on loans at high rates.

Now, take 120 bushels at 7 cents, \$8-40; lime-
stone, 50 cents; ore for a ton of pig, \$2-50, and
labor, \$4, and we have \$15-40, the cheapest
average sum possible to make pig in that re-
gion, and no account taken of taxes or contin-
gencies. I should have stated that the standard
bushel on the S. R. and D. R. R. is 2668 cubic
inches.

I now go on the South and North Road, where
was Red Mountain furnace, and on the Ala-
bama and Chattanooga Road, where is Iron-
dale. The first has been a notable failure, not
having made a ton of pig with less than 150
bushels of coal, and frequently taking much
more. One of the stacks has already been
changed to coke, and the other will be if they
ever get money to run the one already changed.

The blast engine is about large enough for one
coke furnace; is a good machine of vertical
pattern, built by Webster, of Chattanooga.

Irondale did fairly well as hot blast charcoal,
but not sufficiently profitable to be thus run
again. Mr. Thomas has already found a good
coking coal in the Cahaba field. The first, now
called the Eureka Iron Works, is chiefly owned
in the South; the latter by the Messrs. Thomas,
originally of Pennsylvania, and Mr. Breed, of
Cincinnati. Ore used, red fossiliferous; latter
used some limonite.

In East Tennessee there are two hot blast
charcoal furnaces, both in Greene county, and
12 miles distant from the railroad. One has
water-power, the other steam. They are the
Greene County Iron Company and the New
York and East Tennessee Iron Company. They
use a limonite ore, containing considerable
manganese, and both expected to make spiegel-
eisen, but their pig is found to carry too much
percentage of phosphorus. Before this was
ascertained some of it sold at \$70 per ton, gold,
and a local newspaper says a lot was lately sold
under the hammer at \$5 per ton. Their pig
costs them \$20 to \$22 at the railroad depot.

Full \$250,000 of capital is involved in these two
furnaces, which so far is wasted, because of
going into things blind, and want of careful
examination of ores. In one case samples of
pig were had, but not tested. They looked so
well that even Mr. Griswold, of Troy, was de-
ceived. The capital for both came from New
York city.

In Southwest Virginia is one, and in North
Carolina are two hot blast furnaces which have
not been notable successes, the latter especially,
but they are rather out of the range which I
propose to discuss. The actual capital in both
is Northern, and in the latter probably \$300,000
blindly thrown away.

On the Cumberland River, in West Tennessee,
are several hot blast furnaces, but as they are
not accessible to coal for coke, and have pecu-
liar advantages for shipment of product, they do
not come within range of the point I am
discussing.

To return to the S. R. & D. R. R., the Etna
Furnace, formerly warm blast, when started
again will be made hot blast. Hence there will
be in future, leaving out Tecumseh, five hot
blast furnaces on that railroad. They will aver-
age near 90 tons of iron per day. Can they
send that iron to market with profit? At present
there is no margin between the price of
coke foundry iron and that of hot blast char-
coal. The average minimum freight from the
furnaces I have named to Louisville is \$5-70, to
St. Louis \$7, and at present to Cincinnati \$7-30,
but the completion of the C. S. R. R. will re-
duce this to \$5-60. Hence, taking \$16 as the
average cost for the future at the furnaces, and
the very lowest these irons can be delivered in
Louisville is \$21-70, in Cincinnati \$21-60, and
in St. Louis \$23-30.

Now, I admit that this is cheaper than Lake
Superior hot blast irons are made, but the
Lake Superior region cannot make any other,
and her forests are comparatively worthless,
while the Alabama furnaces have near them
numerous veins of coal, some of which, chem-
ists say, are of the best qualities for coke. This
coke should be delivered to these furnaces at
8 cents per bushel; but suppose we estimate at
10 cents, and 90 bushels to the ton, then we
have for one ton of pig: Coke, \$9-00; ore,
\$2-50; limestone, 50c.; labor, \$4, and we have

\$16 for the ton of coke iron, with a possibility
of reducing that amount, while we had \$16 as
the lowest cost of hot blast charcoal, without
any probability of its reduction, and great
doubts of the possibility. Then there is the
great relief from having the care of 50 to 100
mules, repair of wagons, and the taxes and in-
terest on a large investment of dead capital in
land.

Now, these furnaces cannot make cold blast
iron at a profit, for they cannot compete with
more favored localities, nor is their shape
adapted to it, and the warm blast injures the
name, if not the quality. I assume that, to
make any money, they must eventually turn
into coke, and that any future erection of fur-
naces in that region should be small ones,
specially adapted to making strict cold blast
iron, or should be intended to run on coke. At
the same time, until Alabama improves in her
home resources for food, I cannot see that it is
an inviting field for the manufacturer. I have
at least endeavored to present a favorable
view.

Of the warm blast furnaces, Shelby is the
largest establishment; very near \$500,000 has
been expended there. The stacks are distant
six miles from the railroad; the company own
near 20,000 acres of land, and have a wide range
railroad seven miles long, and several narrow
gauge roads to their wood lands. The original
stack, when present company took it, was 41
feet high, with a 9 foot 9 inch bosh, and made
an average of a little over 13 tons per day with
a small fraction less than 90 bushels of char-
coal to the ton of pig. This stack was raised
to 56 feet in height and the bosh to 12 feet in
width. On one day after this raising 31 tons
and 1610 pounds of pig were made with 90
bushels of charcoal to the ton, but the quality
was not good, and the furnace did not act
kindly under such strains, hence the last blast
in this furnace has been worked at a lower
heat, and during a run of 38 months 14 tons
per day made as an average on 130 bushels of
charcoal. It was admitted that the continuous
run and low yield was more profitable than the
former blast. It is seen, therefore, that the
raising of stack has not been of any real ad-
vantage; nevertheless the company erected a
stack 62 feet high with 14 feet bosh, with latest
improvements of water jacket, &c. This stack,
an exact pattern of Tecumseh, had been in
blast some months when I was last in Alabama
(April), and had never made over 15 tons per
day, and frequently as low as 10. It has been
as bad a failure as its Tecumseh and Red Moun-
tain mates, and will have to be run on coke. I
state this point, therefore, for the considera-
tion of your readers, that no stack over 40 feet
high has done well on the limonites of Ala-
bama, with charcoal as a fuel; that those over
60 feet have been failures; that the old Shelby
at 41 feet high and 10 feet bosh made very
near as much and full as good iron as when 56
feet high and 12 feet bosh.

The Ridge Valley furnace is located 9 miles
north of Rome, on the Dalton Railroad. It is
just in its first blast, and a fair record can
hardly yet be made. It is managed by Mr.
McNill, an experienced Pennsylvania iron
master. It has an advantage over the other
furnaces of about 75 cents on freight to a mar-
ket, and can eventually get coke at about 1 cent
over Chattanooga rates. They use both oven
and pit charcoal. Shelby uses nearly all oven
coke. The blast engine of Ridge Valley is two
cylinder horizontal, fitted up by Webster, of
Chattanooga; Shelby has two vertical engines,
the one for the large furnace from Webster.

The money capital of Shelby is all Northern,
and they have pretty well succeeded in freezing
out the Southerners who put in the land.

Etna Furnace is a stack 40 feet high with 9
feet bosh, and though at times making good
iron, has not generally done well. The capital
is Southern, but the whole property will proba-
bly have to be taken for debts due. The bosh
will no doubt be made 11 feet, and a good hot
blast put in for the future. Engine vertical, by
the Nobles. I should have mentioned in my
last that the blast engine of Bartow is 48 by 72
inches, by the Nobles, and that of Chattanooga
same size, by Webster.

At Cedartown, Ga., Mr. West is erecting a
stack 62 feet high, with boshes 14 feet, for hot
blast charcoal. He has spent a large sum of
money to make everything complete, but does
not expect to go in blast very soon. His
moneyed means are large, and he has no large
stock company to interfere with him. In my
next I shall detail the cold blast furnaces, and
then the cost of charcoal, character of woods
and ores in different sections, and other advan-
tages or disadvantages.

HENRY E. COLTON.

The first application of the spectroscope
in quantitative analysis has been made by
Sir John G. N. Alleyne, of the Buttery
Iron Works, near Alfreton, Derbyshire, and
the result of his researches (in which he
has been ably assisted by his son, Mr. Rey-
nold Alleyne) was embodied in a highly inter-
esting paper read before the Iron and Steel In-
stitute recently. The mode of procedure
may be briefly explained thus. With a modifi-
cation of the Bequerel tube, and in an atmos-
phere which will not support combustion, he
first observes the line given in the spectrum by
a body containing a known quantity of phos-
phorus, and then substitutes the body contain-
ing the unknown quantity of phosphorus to be
determined. The phosphorus lines are just blot-
ted out by introducing hydrogen into the tube,
and restored by replacing a portion of the hy-
drogen by a measured quantity of carbonic
acid. The quantity of phosphorus is inverse-
ly as the quantity of gas used. He can esti-
mate in three minutes quantities under 0-300
down to 0-020 per cent, or less, with accuracy;
above 0-500 requires further investigation, owing
to the great power of the phosphorus lines.

For the determination of small quantities of
phosphorus in iron and steel Sir John Alleyne's
discovery is valuable, and may be regarded as
laying the foundation of quantitative spectrum
analysis generally.

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 sidered, at lowest market rates.

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**Iron Making in the South—Hot Blast
 Charcoal Stacks.**

CARTERSVILLE, BARTOW COUNTY, GA., May 25.

To the Editor of *The Iron Age*: Before pro-
 ceeding to enumerate the hot blast charcoal
 furnaces, and discuss their characteristics, I
 shall state some points which have been sug-
 gested as to coke: First, I am asked what are
 the possibilities of cheaper coke? With the
 completion of the Cincinnati Southern Road
 good coke can be delivered in Chattanooga
 with fair profit for 8 cents, and to the Bartow
 (not Barton) furnace for 9 cents per bushel.

It is probable, also, that Suwanee will improve
 the quality of its coke, and also cheapen the
 cost, and the Dade mines will also enter the
 market in the future, as they get their mine
 more fully opened. Again, the Alabama and
 Chattanooga Railroad is now owned by Mr. J.
 C. Stanton, and will be run regularly. Its line
 abounds in coal, but the value for iron making
 is yet to be practically tested in the furnace.

There are numerous points on its line where
 coke should be delivered at a cost of not over
 5 cents per bushel. Again, at no very distant
 day, the railroad now running from this place to
 the slate quarries, at Rockmart, will be con-
 tinued to the A. & C. R. R. and tap the Alabama
 coal fields. This will allow coal and coke to
 be delivered at this point for one to one and a
 half cents per bushel, say, 8 cents in all. Here
 it would meet cheap and rich iron ore, and be
 on a great line of transportation. Second, I am
 asked as to the yield of the furnaces named:

Oakdale was run only twenty days by Mr. Bram-
 well, and then on short allowance of ore and
 coke, with poor quality of the latter, and 20
 tons per day was made, nearly all extra No. 1
 foundry iron. Chattanooga furnace had not
 got to running full before the flood, but had
 made 20 to 22 tons. Bartow will average 22
 tons this blast—it has made 25 tons. Third, as
 to my cost of labor: Oakdale can only be esti-
 mated, as it was never run regularly, but with a
 product of 25 tons per day, and without high
 salaried fancy officers, \$3 per ton would cover
 the labor item. Chattanooga furnace has some
 salaried officers—none high thought—and has
 other labor expenses not incident to a furnace
 near its ore and coal; \$5 per ton on 20 tons per
 day should cover all. Bartow is run more
 cheaply than either of the others, the superin-
 tendent being the only person receiving much
 of a salary, and he only \$2500. Common labor
 is never over \$1 per day. Fourth, as to whence
 came the capital to build these furnaces: Oak-
 dale was from New York and Hartford. The
 Roane Iron Company has its stockholders in
 New York, Ohio, Indiana and Chattanooga;
 the last came originally from the West. The
 Chattanooga furnace is chiefly Minnesota capi-
 tal. Bartow is Georgian, a small part origi-
 nally from Pennsylvania.

The chief seat of hot blast charcoal iron man-
 ufacture in the South is on the line of the Selma,
 Rome and Dalton Railroad. On this road there
 are five strictly hot blast, three which claim
 only warm blast, and one strictly cold blast.

The hot blast are Tecumseh, Stonewall, Rock
 Run, Woodstock and Alabama. The warm
 blast, Ridge Valley, Etna and Shelby. The
 strictly cold blast, Bibb furnace, near Brierfield.

Tecumseh is a well built stack 62 feet high,
 14 feet bosh, and has excellent machinery fit-
 tings, the blast engine being one of Ainslie,
 Cochran & Co.'s vertical, has steam cylinder
 48 by 36 inches, and blast cylinder 48 by 84
 inches, and is a first-class machine. The fur-
 nace has never done well, not having averaged
 over 14 tons per day. The ore is brown hematite
 of good quality. Was about to go out of
 blast when I last heard from there, and would
 make some change in stack or run on coke
 hereafter. Ore is abundant; location one
 mile from railroad, and is connected by a
 branch road. The trouble is in the construction
 of the stack, as Gen. Warner is considered a
 good manager. The greater part of the
 charcoal used in the furnace has been made in
 ovens of the bee-hive pattern. The capital is
 chiefly from the North and West. It is hardly
 necessary to state anything of cost of product
 as the furnace has been a failure.

Stonewall furnace is directly on the railroad.
 The stack is 40 feet high and 11 feet bosh,
 base brick, then straight iron shells. It has
 been as successful as any hot blast furnace in
 the South. It has never run on Sundays. In
 a blast of 13 months stopped two weeks for
 supply of coal, and averaged 18 tons per day of
 excellent iron, much the largest proportion
 foundry, and at a cost of about \$19 per ton.

The blast engine is one of Ainslie, Cochran &
 Co.'s 3 cylinder horizontal, and is a very ex-
 cellent machine. The engineer said it had not
 been stopped for any repairs in the 13 months.
 The capital of the company is almost entirely
 Georgian, with office in Rome, and they have
 lately reduced the stock to \$80,000. The
 furnace is well managed by Capt. Wurtz, and
 he says he has now found where the leaks are,
 and in starting again will be able to make iron
 more cheaply; not now in blast. If any furnace
 can make hot blast iron at a profit it should be
 this one. Uses pit charcoal, and ore is limonite.

Rock Run is a small furnace, calculated for
 12 tons of pig per day; is located near three
 miles from the road, near ore and timber; made
 only a short blast in 1874, and had to stop for
 want of money, being also badly in debt. Blast
 engines are horizontal, being second-hand, re-
 fitted. They made a good quality and quantity
 of iron. Charcoal made in pits.

Woodstock furnace is at Anniston station,
 directly on the railroad. The stack is 40 feet
 high, with 11 feet bosh, and makes an average
 of 18 tons of iron per day. The blast engine
 is vertical, made by Noble Brothers, Rome,
 Ga. The steam cylinder is 48 by 30 inches, and
 the blast cylinder 48 by 72 inches. Ore, limonite,
 from several banks. Charcoal made in pits.
 Capital is partly Georgian and part North-
 ern or Scotch. It is well managed, and has
 abundant capital. Cost of iron per ton about \$19.

Alabama furnace is also directly on the rail-
 road. The stack is 40 feet high, and bosh 9
 feet. It has for many months past made over
 20 tons per day, but the quality is not so good
 as either Stonewall or Woodstock. The blast
 engine is one of Ainslie, Cochran & Co.'s three
 cylinder horizontal, same as Stonewall. Ore,
 limonite, near the furnace. The capital in this
 furnace is, I am informed, all Southern. Cost
 of iron about \$17. Charcoal from pits and
 limonite for ore.

Of these five furnaces all but Tecumseh are
 side hill, all but Tecumseh use pit coal, and all
 use the same character of ore. Generally
 speaking, the pit coal is estimated to cost 8
 cents per bushel in the stock house, but in-
 cluding waste and careless measurement, proba-
 bly has cost not less than 10 cents by the time
 it went into the furnace.

Capt. Wurtz, admitting these facts, thinks
 that, with decreased price of labor and experi-
 ence of the past, he will hereafter be able to
 put charcoal in the Stonewall stack at not over
 6 cents per bushel. Naturally, the cost of char-
 coal should be increasing as the distance of the
 timber is on the increase, as any of these fur-
 naces will use the timber from 300 acres annu-
 ally. It is seen that the Alabama is calculated
 to make iron cheaper than the others, but the
 quality is perhaps proportionably inferior, as a
 hotter blast is used. The consumption of char-
 coal at all but Tecumseh may be safely placed
 at 120 bushels, though some claim to make a
 ton with 110. Placing this at 10 cents, and we
 have \$12 for coal; limestone, 50 cents to \$1 per
 ton of pig; ore, \$3, though some can deliver
 more cheaply; labor at \$4 to \$5. My figures
 are of the past. Hence we have about \$19-50
 as the cost of a ton of pig at the furnace, with-
 out counting interest on loans at high rates.

Now, take 120 bushels at 7 cents, \$8-40; lime-
 stone, 50 cents; ore for a ton of pig, \$2-50, and
 labor, \$4, and we have \$15-40, the cheapest
 average sum possible to make pig in that re-
 gion, and no account taken of taxes or contin-
 gencies. I should have stated that the standard
 bushel on the S. R. and D. R. R. is 2608 cubic
 inches.

I now go on the South and North Road, where
 was Red Mountain furnace, and on the Ala-
 bama and Chattanooga Road, where is Iron-
 dale. The first has been a notable failure, not
 having made a ton of pig with less than 150
 bushels of coal, and frequently taking much
 more. One of the stacks has already been
 changed to coke, and the other will be if they
 ever get money to run the one already changed.

The blast engine is about large enough for one
 coke furnace; is a good machine of vertical
 pattern, built by Webster, of Chattanooga.
 Irondale did fairly well as hot blast charcoal,
 but not sufficiently profitable to be thus run
 again. Mr. Thomas has already found a good
 coking coal in the Cahaba field. The first, now
 called the Eureka Iron Works, is chiefly owned
 in the South; the latter by the Messrs. Thomas,
 originally of Pennsylvania, and Mr. Breed,
 of Cincinnati. Ore used, red fossiliferous; latter
 used some limonite.

In East Tennessee there are two hot blast
 charcoal furnaces, both in Greene county, and
 12 miles distant from the railroad. One has
 water-power, the other steam. They are the
 Greene County Iron Company and the New
 York and East Tennessee Iron Company. They
 use a limonite ore, containing considerable
 manganese, and both expected to make spiegel-
 elsen, but their pig is found to carry too much
 percentage of phosphorus. Before this was
 ascertained some of it sold at \$70 per ton, gold,
 and a local newspaper says a lot was lately sold
 under the hammer at \$5 per ton. Their pig
 costs them \$30 to \$32 at the railroad depot.

Full \$250,000 of capital is involved in these two
 furnaces, which so far is wasted, because of
 going into things blind, and want of careful
 examination of ores. In one case samples of
 pig were had, but not tested. They looked so
 well that even Mr. Griswold, of Troy, was de-
 ceived. The capital for both came from New
 York city.

In Southwest Virginia is one, and in North
 Carolina are two hot blast furnaces which have
 not been notable successes, the latter especially,
 but they are rather out of the range which I
 propose to discuss. The actual capital in both
 is Northern, and in the latter probably \$300,000
 blindly thrown away.

On the Cumberland River, in West Tennessee,
 are several hot blast furnaces, but as they are
 not accessible to coal for coke, and have pecu-
 liar advantages for shipment of product, they
 do not come within range of the point I am
 discussing.

To return to the S. R. & D. R. R., the Etna
 Furnace, formerly warm blast, when started
 again will be made hot blast. Hence there will
 be in future, leaving out Tecumseh, five hot
 blast furnaces on that railroad. They will aver-
 age near 90 tons of iron per day. Can they
 send that iron to market with profit? At present
 there is no margin between the price of
 coke foundry iron and that of hot blast char-
 coal. The average minimum freight from the
 furnaces I have named to Louisville is \$5-70, to
 St. Louis \$7, and at present to Cincinnati \$7-30,
 but the completion of the C. S. R. R. will re-
 duce this to \$5-00. Hence, taking \$16 as the
 average cost for the future at the furnaces, and
 the very lowest these irons can be delivered in
 Louisville is \$21-70, in Cincinnati \$21-00, and
 in St. Louis \$23-30.

Now, I admit that this is cheaper than Lake
 Superior hot blast irons are made, but the
 Lake Superior region cannot make any other,
 and her forests are comparatively worthless,
 while the Alabama furnaces have near them
 numerous veins of coal, some of which, chem-
 ists say, are of the best qualities for coke. This
 coke should be delivered to these furnaces at
 8 cents per bushel; but suppose we estimate at
 10 cents, and 90 bushels to the ton, then we
 have for one ton of pig: Coke, \$9-00; ore,
 \$2-50; limestone, 50c.; labor, \$4, and we have

\$16 for the ton of coke iron, with a possibility
 of reducing that amount, while we had \$16 as
 the lowest cost of hot blast charcoal, without
 any probability of its reduction, and great
 doubts of the possibility. Then there is the
 great relief from having the care of 50 to 100
 mules, repair of wagons, and the taxes and in-
 terest on a large investment of dead capital in
 land.

Now, these furnaces cannot make cold blast
 iron at a profit, for they cannot compete with
 more favored localities, nor is their shape
 adapted to it, and the warm blast injures the
 name, if not the quality. I assume that, to
 make any money, they must eventually turn
 into coke, and that any future erection of fur-
 naces in that region should be small ones,
 specially adapted to making strict cold blast
 iron, or should be intended to run on coke. At
 the same time, until Alabama improves in her
 home resources for food, I cannot see that it is
 an inviting field for the manufacturer. I have

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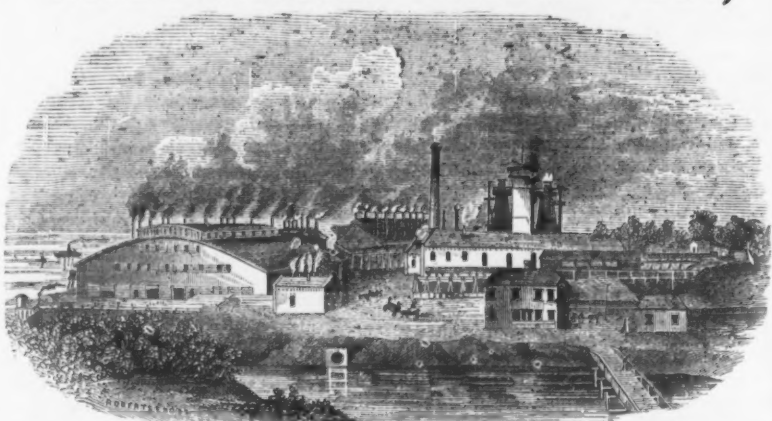
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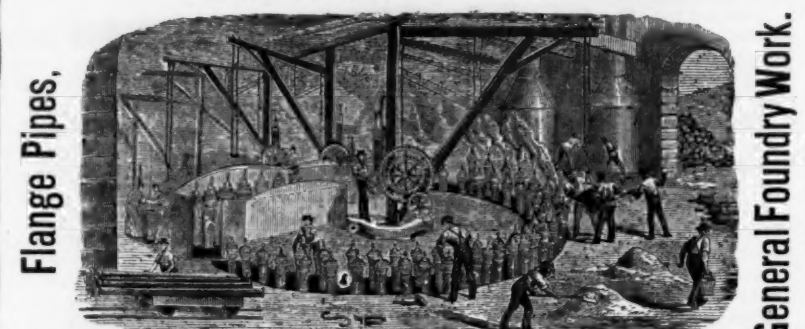
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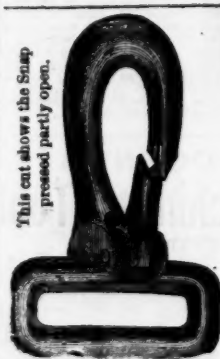
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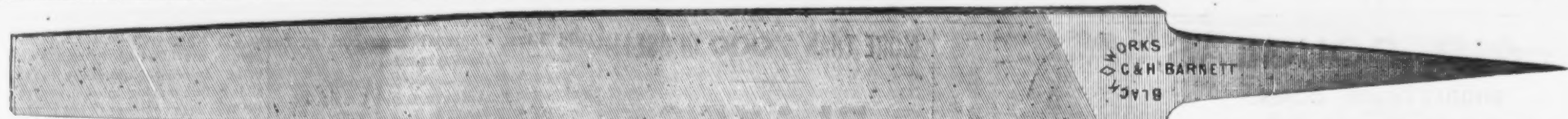
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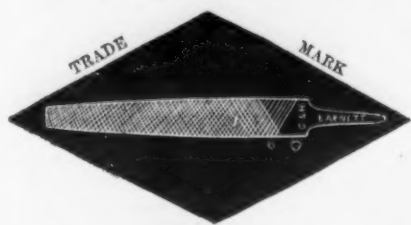
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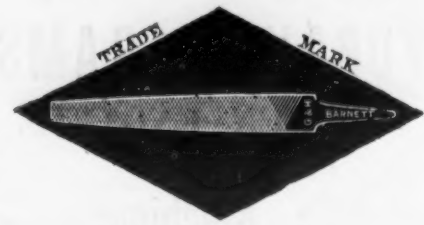
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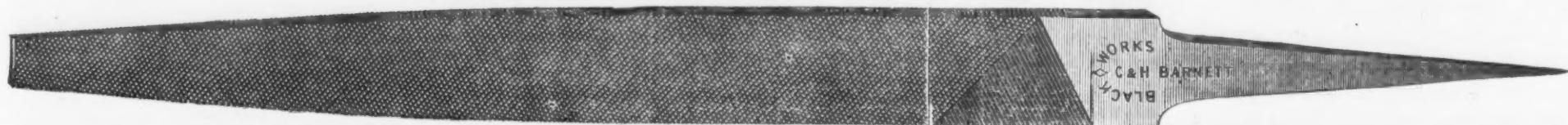
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USE THE BEST.



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The American File Company have the exclusive right to use the Bernot process for cutting files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing files and steel.

Goods of all known manufacturers have been repeatedly tested, and interesting tables have been compiled showing the working qualities of files made by different makers, and of files made from different steels, and with various shapes and angles of tooth. They have thus reduced the manufacture of files to an exactness and perfection with a uniformity of result, as they believe, never before attained. No file, foreign or domestic, that they have ever tested, has equalled the performances of their own goods taken at random from their stock. Their machines are capable of the most delicate adjustment, and can produce the very finest work known to the trade. Special files made to order. Prominent file manufacturers are having their best goods from our works.

Price lists and information furnished on application.

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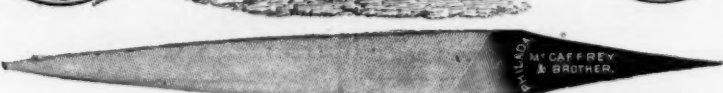
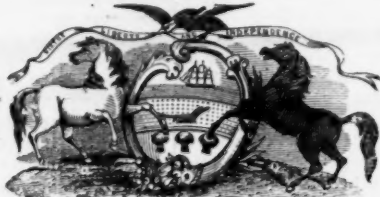
THE BEST IS THE CHEAPEST.

McCaffrey's Standard American Hand Cut Files and Rasps are warranted to do more work than any other files and rasps in the market.

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No oil or attention required. Runs with little or no wear. No dirt or danger from fire. No damage to goods in process of manufacture. Years in use by best concerns, who are refitting old, and ordering new machinery to be metalined.

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PATENT COMBINATION WRENCH.

These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, Case-Hardened throughout, and not only combine all of the superior qualities of our cylinder or Gas Pipe Wrenches, but also all requisite combinations of a regular Nut Wrench, thus making a Combination which has no equal.

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EVERY FILE WARRANTED.

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LARGEST CAPACITY
Of any File Works in the World.
In the face of strong prejudice against American files, this brand has earned a reputation second to none. The trade in all sections testify to their excellence. We confidently offer these files as superior in every respect and cheaper than any first-class file in the market. A trial will confirm their reputation.
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FILES
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RASPS.
XTRA QUALITY,
MADE FROM THE BEST
IMPORTED STEEL
BY THE
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JOHN ROTHERY'S Celebrated Hand-Cut FILES,

Made of Best English Cast Steel.

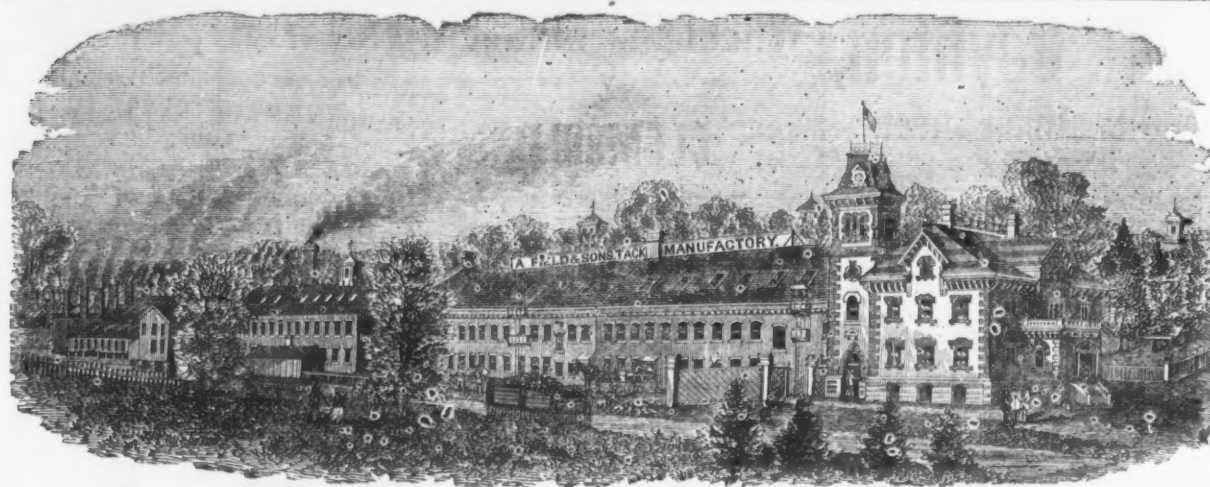
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BEST HAND CUT FILES.

Warranted Superior Quality.

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TAUNTON, MASS., Manufacturers of

Copper and Iron Tacks, Tinned Tacks,

SUPERIOR SWEDES IRON TACKS, for Upholsterers' Use, Saddlers' Supply, Card Clothing, etc., etc.

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Zinc and teal Shoe Nails, Carpet, Brush and Cimp Tacks, Common and Patent Brads, Finishing Nails, Annealed Trunk and Clout Nails, Hob and Hungarian Nails,

Copper and Iron Boat Nails, Patent Copper Plated Tacks and Nails, Fine Two Penny and Three Penny Nails, Channel, Cigar Box and Chair Nails, Leathered Carpet Tacks, Glaziers' Points, etc., etc.

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WAREHOUSE AT 35 CHAMBERS STREET, NEW YORK, where may be found a full assortment of Tacks, Brads, &c. for the accommodation of the New York Wholesale and Jobbing Trade.

Any variations from the regular size or shape of the above named goods made from samples, to order.

Hopkins & Dickinson Manufacturing Co.,

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Hand Made Locks and Real Bronze Hardware.

NEW AND ARTISTIC DESIGNS FOR

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Tempered Steel Spiral Springs,

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Of all sizes and descriptions, made to order by
Our Springs are used by the U. S. Government, and various Meteorological and other Scientific Institutions.

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Manufacturers of FINE

Electro-Plated Table Ware

OF EVERY DESCRIPTION,

Would call especial attention to their new

Patent China-Lined

ICE PITCHERS.



These Pitchers are made of the finest quality of white metal, heavily plated with silver. They are fully engraved and chased in a great variety of decorations. The linings are of fine stone china. The top is secured to the body of the Pitcher in such a manner that it can be easily detached and the lining removed for cleaning or other purposes.

Many improvements attained are noticeable in these Pitchers. Water and ice standing in them do not come in contact with any metal whatever. They are perfectly clean, and easily kept so. They are perfectly free from all odor or rust. Lemonade, beer, milk, etc., may be kept cool in and drawn from these pitchers without endangering health. There can be nothing cleaner or purer for holding liquids than pure, white china. There is no possibility of leakage.

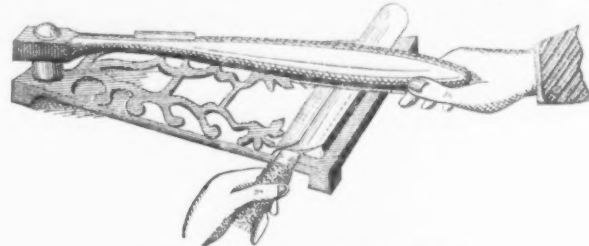
The construction of the Pitcher is such that the lining can be easily replaced at a very small cost.

Factories, Taunton, Mass.

Salesroom, No. 2 Maiden Lane, New York.

Beardsley's "Edge Abrader."

Among the large number of knife sharpeners from first to last thrown on the market, none hitherto have taken a permanent place in the hardware trade, notwithstanding the manifest need of a good device for the purpose. Mr. Beardsley, who has adopted the trade-mark, "Abrader," to distinguish his improvement from others devised for the same or similar uses, has recently made arrangements for the manufacture and the sale to the trade of the improved implement shown in the accompanying engravings, which is essentially different from all others. A triangular frame, 8 by 5 inches, carries a pivoted lever having a sharpening file on its under side. Upon the frame underneath the file are rests, or holding devices, cast in one piece with the frame, which hold the knife in the position shown in Fig. 1, the back of the knife being under one rest while the edge rests upon the other. The lever being moved from point to handle of the knife, the file is brought upon the inclined edge surface of the same and abrades it to the required de-



BEARDSLEY'S "EDGE ABRADER."—Fig. 1.

gree of sharpness, the knife being simply turned over to repeat the operation upon the opposite side or edge surface, the course of the file being straight along the edge of the blade, notwithstanding any variation of hardness in the latter, so that soft spots in the blade are not hollowed out. Fig. 2 shows the abrader as used for sharpening scissors, the latter being steadied in notches provided in the frame and rests, and the file being brought along the edge of the blade from the point to the outer end abrades or sharpens the same. The finish to the edge is at the proper level, given by drawing it over a small "steel" fixed in the top of the lever.

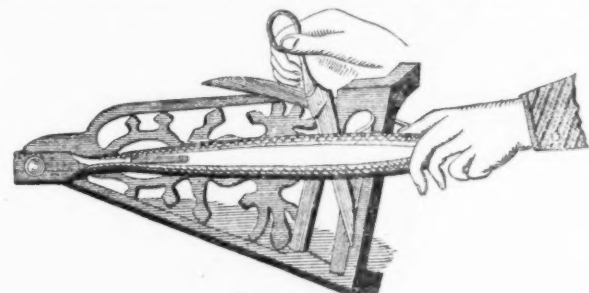


Fig. 2.

The "edge abrader" is highly recommended for utility and durability, and being almost wholly of metal is designed for general introduction through the hardware trade. The implements are packed in boxes of one dozen each, which are placed for shipping and export in cases of four, six and twelve dozen by the inventor and manufacturer, J. H. Beardsley, 119 Nassau street, New York city.

Iron in the Southwest.

Mr. Wm. Burns, in a letter to the Pittsburgh Commercial, says:

The northern part of this State (Alabama) has, perhaps, one of the largest iron mountains yet discovered in the world, being about 45 miles in length and three quarters of a mile in width at the base, and 175 feet high, with a continuous vein of iron ore the entire length. The ore is of the kind generally known as the fossil or drystone species, and is found cropping out on the west side of the mountain (as the mountain runs north and south), near the top, and shows a vein near 40 feet in thickness, and dipping about 45 degrees to the east. The ore lies in strata from six inches to one foot thick, like sand or free stone rock, lying closely compact, one upon the top of another, making it quite easy to mine after the covering is removed, which, of course, is quite expensive in some places, as the covering in some instances is so heavy that the ore has to be drifted after, as we go after coal here.

Near this mountain is the very flourishing town of Birmingham, on the Nashville and Great Southern Railroad, which has sprung up since the war to the size of 10,000 inhabitants, with a fair prospect of getting the State capital removed there before many years, on account of the great future prosperity which is expected to be derived from this iron deposit. There have been three furnaces erected within a short distance of Birmingham, and had it not been for the panic, many more would have been in the course of erection, as there are large coal fields almost adjoining, which are said to furnish excellent coke for smelting purposes.

I passed from here to Northern Georgia. Here I found a different kind or species of iron ore, that known as the brown hematite, which, I must say, astonished me, and I think will astonish all who examine it. I say it will astonish any one to learn that we have such immense bodies of iron ore which are comparatively unknown to the world.

Of Tennessee, Mr. Burns says: "This State has one of the finest futures, as an iron manufacturing State, of any in the Union. To substantiate this, I will mention a few of the advantages which this State has in minerals over others. In the first place, it is centrally located, being the nearest and most ready of access to the great coal fields of Indiana and Illinois, I might say almost contiguous, having the two great rivers, the Cumberland and the

Tennessee, which are navigable the year round, and right through the center of the State, passing through its entire length, and with their tributaries making an outlet water transportation to almost every locality where ore abounds, in quantity and quality which, I think, is not excelled in the United States, if in the world. I will just say that the iron ores are inexhaustible, making the Lake Superior, as well as Missouri mines, secondary. Knowing what I say, I will be content as to iron ore. I still further think that these iron ore fields on the Lower Tennessee and Cumberland rivers are the most ready ores that can be reached from Pittsburgh, being almost directly upon the Ohio River.

But the great wealth of Tennessee is that she has all the requirements requisite to making iron within her own grasp, having coal fields in extent equal to Pennsylvania, and in addition to that, has immense forests, which will furnish charcoal for years to come, which is almost indispensable for making a certain grade of iron that we must have. Very few who have never made a proper investigation of this

State would fail to be astonished to see what they are doing in regard to mining and coking coal. I will take, for instance, the Sewanee mines, near Cowan, on the Nashville & Chattanooga Railroad. These mines employ from six to seven hundred hands, and have a capacity for shipping four millions of bushels per annum, coking about one half of their shipments, it being an excellent quality, which can be made to be delivered at any point by rail in the State at eight cents per bushel. These mines or coal fields extend over the greater part of Grundy and Marion counties, the vein being about a 4 1/2 foot vein, but these mines

are not all, by any means. There are many others, but of less note, however, as the coal fields cover near one fourth of the State.

The Pittsburgh Commercial says: We have once or twice alluded to the fact that the Brown Iron and Steel Company, of Youngstown, Ohio, one of the heaviest corporations of the West, were building docks and laying the foundations for a large rolling mill at South Chicago, in order to be more convenient to the ores of Lake Superior. Mr. Joseph H. Brown, the president, is one of the most experienced coal miners in Ohio, and it now turns out that this new mammoth enterprise is the result of a recent discovery of extensive and valuable beds of a superior quality of soft coal, remarkably free from sulphur, in the immediate vicinity. The coal was discovered on leased land, the lease of which was within a year or two of expiration, and the most strenuous efforts were made to keep the matter quiet until the property could be secured by release or purchase. These, it seems, were successful. All the indications are said to point to the existence of equally valuable deposits in the neighborhood. This discovery is likely to prove of great advantage to Chicago, and to the various manufacturing interests centering in that region. The Illinois State Geologist, in his last report, utterly discredited the possibility of the existence of a bituminous coal stratum in the northern portion of that State.

The rolling mill at Marietta, Ohio, is running on a small force, at Pittsburgh prices, without a "union" man in the mill, and with help enough ready, whenever the prospect will justify, to work the mill to its full capacity.

The vein of plumbago at Byer's Station, Pa., on the Pickering Valley Railroad, is 57 feet wide and 30 feet deep, and yields 20 per cent. Buildings and machinery for working it are going up rapidly, and the neighborhood is consequently active.

The Pottstown Iron Company have stopped their blast furnace for the purpose of "blowing it out" for repairs. It has been in blast now continuously for about seven years. None of the men engaged at the furnace will be thrown out of employment, but will be engaged on the repairs.

The Baltimore Journal of Commerce notes the sale of 20,000 pounds ore knob copper to Messrs. Henry McShane & Co., brass and bell founders of that city. This is the first product of ingots of the Ore-Knob Copper Co., located in the Allegheny mountains of North Carolina, and owned by citizens of Baltimore. The company have opened their mines and erected extensive reduction works, and will hereafter be in regular receipt of ingots and bars. Workers in copper pronounced the quality to be very superior.

GEORGE GUEUTAL & SON,

39 West 4th St., New York.



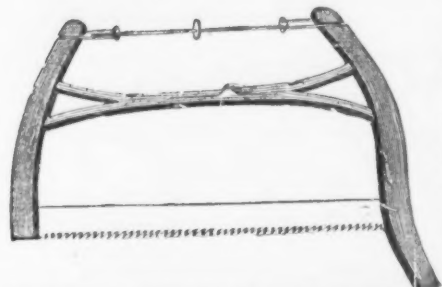
IMPORTER OF
Wood Screws, Steel in Sheets,
BAND SAWS, TOOLS FOR BRAZING, &c.
Bed Screws, Pin Hinges, and Wire Nails a Specialty.

H. W. PEACE,

MANUFACTURER OF

Saws of all kinds.

FACTORY, WILLIAMSBURG, N. Y.

**Elliptic Forked Saw Frame.**

Patented June 28th, 1870.

The annexed engraving represents my ELLIPTIC FORKED SAW FRAME, which commands itself to the trade for its simplicity of construction. The Forked Frame being all in one piece, without any center bolt, secures for the Frame great strength and durability. These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

HARVEY W. PEACE,
Sole Proprietor & Manufacturer,
VULCAN SAW WORKS,
WILLIAMSBURG, N. Y.

**THE SILVER STEEL
DIAMOND CROSS-CUT SAW.**

\$1.50 Per Foot.

Patent Secured

THIS new Saw, which is destined to take the place of all Cross-cut Saws in point of **SPEED AND EASE**, is manufactured by **E. C. ATKINS & CO., Indianapolis, Ind.**, who are the **SOLE MANUFACTURERS FOR THE UNITED STATES.** So confident are we that this is the best Cross-cut Saw in the market that we **CHALLENGE THE WORLD.** Orders promptly filled.
E. C. ATKINS, H. KNIPPENBERG.
Saw Manufacturers and Repairers, Indianapolis, Ind.

**Lloyd, Supplee & Walton,
HARDWARE FACTORS.**

MANUFACTURERS OF

**Bonney's Hollow
AUGERS.**Stearn's Hollow Augers
and Saw Vises

Bonney's Spoke Trimmers

Double Edge Spoke Shaves

Adjustable Gate Hinges

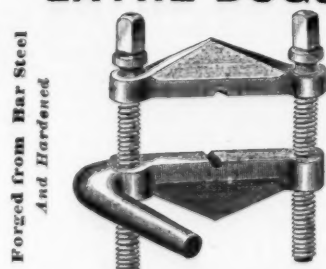
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Flat Key Brass and Iron Pad Locks, &c., &c.

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BILLINGS & SPENCER CO.MANUFACTURERS OF
CLAMP, DIE AND COMMON
LATHE DOGS.

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First Class Articles,
and something that every machinist and Tool Maker will appreciate.
Also, all Descriptions of Wrought Iron & Steel**DROP FORGINGS.**

For Machine Handles, Lathe Wrenches,
Spinning Rings, Marlin Spikes, Clinch Rings,
Thumb Screws, Thumb Nuts, and Parts of Drill
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Machinery Generally.



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Thirty Varieties now made, Forged Solid from Bar Steel and Cold Pressed. Also,
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Manufacturer of

**Saws of all kinds.
LIGHTNING SAWS.**

Also Sole Manufacturer of

Two Direct Cutting Edges, instead of one Scraping point.



Note extra steel and durability over the old V, contained on M tooth.

Telegram Dated Oct. 1st, 1874.

STATE FAIR, EASTON, PA.

To HENRY DISTON & SONS:

Philadelphia, Pa.

I want you to publicly test that challenge on Cross Cut Saws. Name time and place within thirty days. American Institute preferred. E. M. BOYNTON.

E. M. Boynton gave on Wednesday of last week an exhibition of what his Lightning Saw could do at the Pennsylvania State Fair, in which two men sawed through a sound oak log, 16 inches in diameter, in 17 seconds. Mr. Boynton informs us that his export trade is increasing, he having lately made large shipments of his saws to Australia and other distant markets.—*The Iron Age*, Oct. 8, 1874.

For fuller report of this exhibition see the *Eastern Morning Dispatch* of Oct. 1st, 1874.
Henry Diston & Sons cannot furnish Lightning Saws. Why do they imitate mine?

**J. FLINT,**

Manufacturer of

**ALL KINDS OF
SAWS**And Plastering Trowels,
ROCHESTER, N. Y.

A large Stock of Cross Cut Saws constantly on hand. Orders filled promptly. Dietrich's Double handle One Man Cross Cut Saw made with any kind of tooth desired. Our patent method of grinding Hand Saws makes them superior to any in the market. Send for Illustrated Price List.



PATENT 1866.

Putnam's Government Standard
FORGED**HORSE SHOE NAILS.**Manufactured from the best of NORWAY Iron,
and warranted to give entire satisfaction.S. S. PUTNAM & CO.,
NEWPORT, WASH.**Rogers' Self-Sharpening
HOE.**

The best Hoe in market. It will not batter or break. Wears itself sharp. Will last twice as long as any other Hoe, and is warranted to cut the "Bolles Hoe" or any Hoe in market.

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RUSSELL & ERWIN MFG. CO., - - New York.
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**WILSON & EVENDEN'S
PATENT
OIL
TANKS.**

Superior to all others for Carbon and Lubricating Oils.
For descriptive circulars and prices address the manufacturers,
Shipping Can Mfg. Co.,
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No. 1 Platt Street, N. Y.

Has in stock a Full Assortment of

ENGLISH & ATLANTIC SCREWS,

both Iron and Brass, Flat and Round Headed, and begs his friends will inquire from him rather than his competitors as to his ability to supply them.

**WHEELER, MADDEN
&
CLEMSON,**

Manufacturers of Warranted Cast Steel

SAWSof every description,
including

Circular, Shingle, Cross Cut,
Mill, Hand, Roberts' and
other Wood Saws,
&c., &c

Cast Steel Files

of the well known brand of

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BRANCH OFFICE:

97 Chambers Street, New York.

BRUNDAGE FORGED HORSE NAILS,

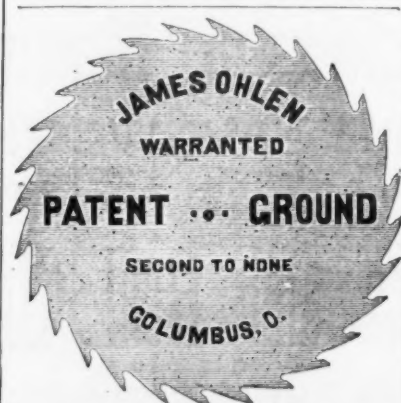
Manufactured from

BEST NORWAY IRON,

by BRUNDAGE & CO. Sold by

WHEELER, MADDEN & CLEMSON

Middletown, Orange Co., N. Y.



make a specialty of the LARGEST SIZES of Circular Saws, and call particular attention of lumber manufacturers to the following points of excellence:
Evenness of Temper.—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.
Perfect Accuracy in Thickness.—My saws are ground on a patent machine, automatic in its operation, grinding off the thick places upon the plate before the thinner parts are reached, and when the saw is removed **BALANCES PERFECTLY**, which is proof positive of the right accomplishment of the work.
Properly Hammered.—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the rim, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time RUN TRUE. This department is under the personal supervision of myself, who has devoted over twenty years to the art of saw making.
I am sole proprietor and manufacturer of the celebrated "Challenge" Cross-Cut Saw. Price Lists of all kinds of saws sent on application.

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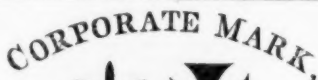
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The iron trade has lost a prominent and valued member in the death of John J. Thompson, Esq., the senior partner of the firm of L. P. Morris & Co., marine engine and general machinery builders. Mr. Thompson was universally popular; a thorough business man; an excellent citizen, and in his daily connection with the works he conducted, had given it a reputation for thoroughgoing excellence which was the secret of the great prosperity it attained.

The report of the architect of the new public building, as to the amount of material used therein since the commencement of the work, Aug. 10, 1871, to the 15th of May, 1875, shows the consuming demand of such an undertaking. The excavation amounted to 145,876 55 100 cubic yards; the rough masonry to 37,053 perches; the wrought and rolled iron to 1,300 410 lbs., and the cast iron to 301,400 lbs.; the marble to 57,482 cubic feet; sandstone, 6150 cubic feet; dressed granite, 114,484 cubic feet; slate, 21,000 superficial feet; hydraulic cement, 448 barrels; lumber, 764,000 feet, and bricks, 16,117,470. The amounts are stupendous, and it is stated no such number of millions of bricks was ever laid on any one building before, or in the same time.

The greater frequency of liberal bequests to scientific objects is agreeably noticeable. The late death of Mr. John H. Towse, just deceased, by whose will a legacy in value over \$1,000,000 is left to the Department of Science of the University of Pennsylvania. This is said to be the largest donation ever

PHILADELPHIA CORRESPONDENCE.

PHILADELPHIA, May 31, 1875.

This city is fast assuming the dull and deserted appearance common to the summer months, when all the business which is done is comprised in supplying a small near-by trade, and preparing for the fall operations. This refers, however, principally to general business, as whatever is to be done in the iron trade for the first half of 1875 must now be condensed within the next thirty days. Last week, contrary to expectation, there was quite a movement in pig metal, with more sales than have been crowded into any given six days for some months, and yet the aggregate of the whole week's work was not equal to that of one morning in the flush times of '73. How the trade recurs in sadness to that lively year. When pig iron, costing \$25 to make, sold for \$50; when bars were five cents per pound as a base price; when iron rails sold for ten per cent. more than steel sell for now; when steel sold for more than double the present price, and when the chief end and aim of man was to build and run a blast furnace, and of all furnaces a charcoal furnace; when the product cost \$15 per ton, and sold for \$65. That was the period when every one saw nothing in the future but glorious prosperity; when the most seductive of figures, and the soundest business judgment clearly demonstrated that, as we were building per annum so many miles of railway, requiring so many tons of iron per mile for plant and equipment, and as the various industries were consuming so many tons of iron per annum, with such an increase yearly, and as our furnace capacity was so many thousand tons, therefore, in all certainty, we would require so many thousand tons more iron in 1875-'76 than we had used in 1873, and hence so many more furnaces, Q. E. D. That was when furnace men built new stacks and new houses; when the commissions of one broker here amounted to over \$65,000 at one per cent on his sales for one season; when to own an ore mine was better than to own a gold mine; when certain Champlain ore sellers complacently announced at New Year's to their customers that no orders for ore not forwarded before the middle of January would be considered for that year; when the Iron Mountain ores were quietly offered as follows, viz: "Please note that on and after January 1st, the price of Iron Mountain ore at Carondelet will be advanced from \$5.25 to \$10 per ton;" and when the Coal King who freighted these ores in return barges similarly announced that for the future the freight on Missouri ore from St. Louis to Pittsburg would be advanced from \$5 to \$6 per ton. It was then that a modest "five" in pig iron was taken, which required \$3,000,000 to cover it, and which, by the way, never was covered, and when there was but one man in the city who believed iron would ever be any lower, and he was christened the "constitutional bear." Those were the days of mechanical puddlers to wipe out the unions; of petroleum heaters and furnaces; of mechanical abbies; of anything or everything which looked toward the end being plated with millions. In short, when we were all, and for the time being, with reason, veritable Mulberry Sellers in our enthusiasm, and when our transatlantic cousins shared in our prosperity to the great subsequent damage of their interest accounts. And we built the furnaces that we needed, all of them, some unfortunately not being placed "where they would do the most good," and we started the rolling mill for the rails for that additional amount of rail-way, and made the car shops and the wheel foundries to supply the rolling stock, and organized all sorts of joint stock trusts to hire the same to the railway companies in *esse*, and we sent to England and borrowed money on the bonds of all the companies in *potest*; and the prosperity was without limit. But Chicago was burned and Jay Cooke & Co. failed; the North Pacific venture "subsided"; the Texas and Pacific stood still; the furnaces didn't all get blown in, and some that were in got blown out—of existence—so far as their capital was concerned; the car shops and wheel foundries were idle, and the trust company business was principally on trust, as their titles indicated. The broker who made \$65,000 commissions in one year subsided, grateful for \$6500, and the "constitutional bear" was alone smiling and complacent with "Didn't I tell you so six months ago." Happy consolation for the destruction of such halcyon hopes. And now, after two years of tribulation, the trade has again lost the 8-illers' business; has painfully, with patience and economy, again climbed the hill which leads to moderate prosperity, and is once more ready, with industry, economy and thrift, to earn and be satisfied with small gains and steady business. It has learned, of all things, how cheap iron can be made in the tight place; how to stop leaks; how to get cheaper ores; how to resist advances of wages; how to live economically, and, best of all, that there is money in the iron business soberly conducted. But yet it has not divested itself of the class of wisecracks who, most blatant in prosperity, are equally croakers in adversity. Those who declare that the productive capacity of the country is ten years in advance of its consuming ability and who with, unfortunately, capital invested in the business contribute nothing but demoralization and depression to the industry. And after such an unconscionable credit to the departed brilliancy of '73 we note the gossip of the week.

The iron trade has lost a prominent and valued member in the death of John J. Thompson, Esq., the senior partner of the firm of L. P. Morris & Co., marine engine and general machinery builders. Mr. Thompson was universally popular; a thorough business man; an excellent citizen, and in his daily connection with the works he conducted, had given it a reputation for thoroughgoing excellence which was the secret of the great prosperity it attained.

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made for scientific education, and ensures the best instruction in Chemistry, as applied to the arts; Geology, as connected with mining; Civil and Mechanical Engineering, Architecture, &c., shall be always attainable with the usual curriculum of the University.

Rumor has it that the Baltimore and Ohio and Philadelphia and Reading Railroad Company have, with the Wilmington and Reading Railroad Company, formed a tripartite agreement, and obtained control of the Baltimore, Philadelphia and New York Railroad. By building a link of 75 miles of road it is said a through connection with New York, on the side of the Pennsylvania road, may be had. Whether the outlet for anthracite in Baltimore would compensate the Reading for the increased facilities afforded the Baltimore and Ohio in delivering bituminous at New York, remains to be seen, but that some extensive railroad scheme is afloat is certain. The nomination of Mr. Henry Rawle, of Erie, for the position of State Treasurer, of Pennsylvania, is noticeable since the individual in question is a somewhat prominent iron maker. Mr. Rawle is the present mayor of Erie, and prominently connected with the Erie Rolling Mill and other iron industries there. His earliest knowledge of iron making was received at the old Freedom Iron Works, of Millin county; later he was a railway surveyor under J. Edgar Thompson, the late president of the Pennsylvania Railroad, then engineer of the company, and subsequently first assistant engineer of the Philadelphia and Erie Railroad. In 1859 he bought the Sharon furnace, in Mercer county, and is said, under the firm of Rawle, Noble & Co., to have been the first to use the raw bituminous coals of the Senago and Mahoning Valleys in reducing Lake Superior Ore, but this, from other records, we think hardly correct. He also built the Erie Blast Furnace, and, as above stated, established the Erie Rolling Mill. A thorough iron maker, of sound judgment, great energy and uncompromising integrity, it is encouraging to see such a man nominated for so important a trust, as well as indicative of returning reason in politics.

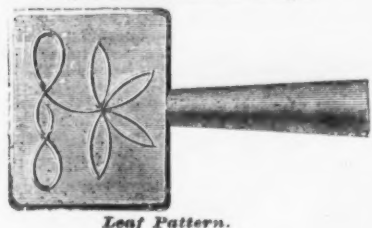
Mountain Railways.

It is now in contemplation to establish a railway across the Simpson on the rack and wheel system (Riggenbach's) now in operation for the ascent of the Righi. With ordinary engines the gradient cannot exceed eight per cent.; beyond that limit, the locomotive could hardly work itself up alone. Whenever higher slopes have to be overcome without fetching a long circuit, as has been done, for instance, on the Trieste and Vienna line, it is found necessary to have recourse to peculiar contrivances, which may be distinguished into two classes, viz.: 1. A system of funicular traction, by which both passengers and goods are towed up an inclined plane by fixed engines working a horizontal drum, round which the cable or chain attached to the train is wound for the ascent, unwinding itself for the descent. This system is in use at the Croix Rousse, at Lyons, for the service of the Dombes Railway, one of the most delightful little lines in France. The gradient there is sixteen per cent.; the drum is fourteen feet in diameter, and provided with powerful breaks; the cable is made of 252 iron wires, and has a diameter of two and a half inches. The number of passengers on this inclined plane averages 30,000 daily, beside luggage and provisions. 2. The Riggenbach system, mentioned above. The vertical altitude of the Righi-Kulm above the Lake of Lucerne is 1360 metres; the total length to be performed is 8300 metres; the gradient varies between nineteen and twenty-five per cent., and is only interrupted by the landing-places at the stations of Witznau, Kaltbad, and Staffel. The line is constructed with common rails, between and parallel to which there runs a central rack, which looks like a very narrow ladder, and along which a toothed wheel, made of Krupp steel, works. Another similar one, borne by the front axle-tree, acts as a guide or as a break, at will; another, and very simple break, regulates the velocity of the descent. The speed of the train does not exceed four miles an hour. The whole line, rolling stock included, did not cost more than 1,200,000 francs in 1873, when it began to work with only three engines. It now has thirteen, and will have thirty as soon as the Arth-Staffel section is finished.

It is now some two hundred years since phosphorus was discovered by a German chemist, and it is less than fifty years since phosphorus became an article of extended manufacture in connection with lucifer matches, as a medicine, in various combinations, as a means for the extermination of vermin, and as a component in some of the best fertilizers, it being an indispensable food for plant life. The bones and brain of every human being require a certain portion of phosphorus, and there is said to be more than a pound of pure phosphorus in a man or woman of average size. It is true we do not actually eat this substance in its pure and concentrated state, but it is nevertheless a constituent of our food in combination with other elements. The cereals obtain it from the phosphates, and we get it in a similar manner from the particles of our daily nourishment. Phosphorus was at first obtained, though only in small quantities, by a long and tedious process, from urine. It is now obtained, in more ample supply, from bones. It is generally of a light amber color, and is semi-transparent, and in appearance greatly resembles fine wax. When more carefully prepared it is almost colorless. It is highly combustible, and burns in common air with great rapidity, emitting a luminous vapor. Phosphorus can be easily cut with a knife, and by the aid of suitable machinery can be readily drawn out in a good sized "cord" to a considerable length. Its specific gravity is 1.77. It is insoluble in water; but when subjected to a heat of 145 degrees it takes fire, and burns with a very bright flame. When phosphorus is inflamed in oxygen, the light and heat are very intense, while the flame greatly dazzles and confuses the eye of the observer. Phosphoric acid is a combination of phosphorus with a salifiable base. When phosphorus was first used in the manufacture of matches, its price in Europe was twenty dollars per pound, but by recent improved and economical chemical processes in its production, more accessible material, and other causes, its cost now does not exceed one dollar per pound, and is frequently much less. The seat of its largest production is in Germany, with factories all over some extent in Great Britain and in the United States.

H. D. SMITH & CO., PLANTSVILLE, CONN.

Patent Embossed Steps.



Leaf Pattern.

King Bolt Yokes.



Established 1850.

No. 6 Fifth Wheels.



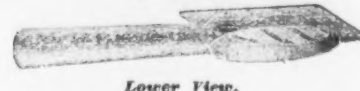
1871 Pattern Shaft Couplings.



Patent Cross Bar Steps.

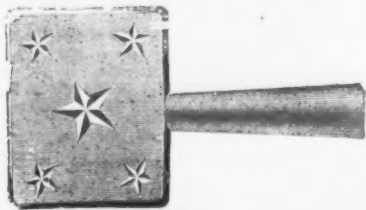
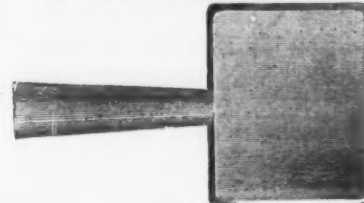


Upper View.



Lower View.

Solid Plain Pattern Steps.



Star Pattern.

Smith's Improved Philadelphia Pattern Slat Irons.



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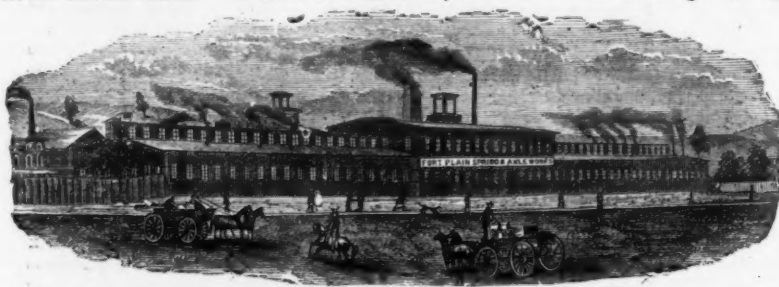
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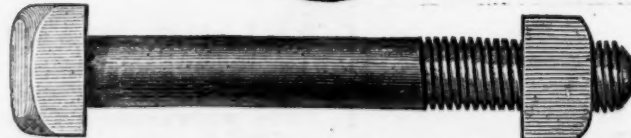
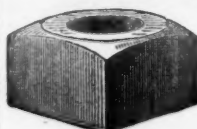
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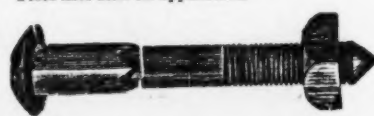
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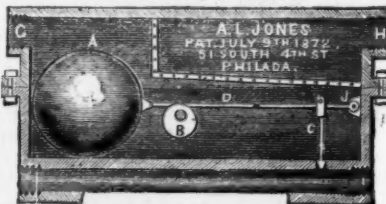
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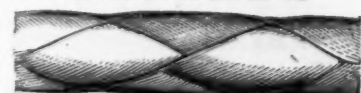
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The Iron Age.

New York, Thursday, June 3, 1878.

DAVID WILLIAMS - Publisher and Proprietor.
JAMES C. BAYLES - Editor.
JOHN S. KING - Business Manager.

New York, January 2, 1878.

Until 1st instant the postage on newspapers was paid by subscribers at the office where the paper was received, the yearly rates on the different editions of *The Iron Age* being as follows: Weekly, 60 cents; Semi-Monthly, 40c. m.; Monthly, 24 cents. Under the provisions of the new postal law, which went into effect on the 1st instant, prepayment at the office of mailing is required, at the rate of two cents per pound for the Weekly, and three cents per pound for the Semi-Monthly and Monthly, which will make the postage as follows on the different editions: Weekly, 50 cents; Semi-Monthly, 30 cents; Monthly, 18 cents.

Our rates of subscription will therefore be as follows:

Weekly Edition.....\$4.50 a year.
Issued every Thursday Morning. Contains full Trade Reports for the week, brought up to the close of business on the previous day.
Semi-Monthly Edition.....\$2.30 a year.
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All communications should be addressed to

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CHARLES CHURCHILL & Co., American Merchants, 25 Wilson Street, Finsbury, London, England, will receive subscriptions (all postage prepaid) by remittance at the following prices in sterling: Great Britain and France, 3s.; Germany, Prussia and Belgium, 3s. 6d.; Sweden, 4s. They will also accept orders for advertisements, for which they will give prices on application.

City subscribers will confer a favor upon the Publisher, by reporting at this office any delinquency on the part of carriers in delivering *The Iron Age*; also, the loss of any papers for which the carriers are responsible. Our carriers are instructed to deliver papers only to persons authorized to receive them, and not to throw them in hall ways or upon stairs; and it is our desire and intention to enforce this rule in every instance.

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Goods for Exhibition at the Centennial.

"What shall I make for the Centennial?" is a question which a great many intending exhibitors are just now revolving in their minds. We hope they will answer it sensibly, by resolving to make the very best articles of practical utility which they can. In a great many cases, however, the decision will be reached that it is best to make something so very elegant that if people do not laugh at it when it is done, they will certainly wonder what induced the exhibitor to waste so much time and money upon an article which is worthless for any purpose save that of exhibition in a glass case. For example, we heard, the other day, of a manufacturer of mowing machines who has made up his mind to do something stunning. A dozen or more draughtsmen have been invited to send in designs, from which the most elegant and elaborate will be selected; and the manu-

facturer has given them to understand that they need not spare the ornamentation, as he is prepared to spend \$10,000, if necessary, on this one machine. We have no doubt it will be very pretty when finished, and that it will excite the admiration of wondering rustics, to whom such unwonted magnificence in a mowing machine will be a nine days' marvel—although if he were going to buy one it is doubtful if he would choose that kind; but it will be a waste of valuable time, and of money which might have been better employed. Everybody will know that it is an advertising "dodge"—a bit of characteristically American humbug—and it will influence nobody's judgment. It cannot by any possibility be a good mowing machine, and it will not take a premium, if at all, any the more readily because its wheels are gilded, its working parts silver plated and its seat upholstered with velvet. It will not, moreover, be in any respect a fair sample of the American mowing machine, nor of the product of the manufactory from which it will profess to have come. In a word, it will be a great toy, awkward in shape, and useless either as an article of trade or as an exhibit.

Let us not be misunderstood as counseling an indifference on the part of manufacturers to grace of form and beauty of appropriate ornamentation for their own sake. If, for instance, a mowing machine manufacturer was willing to spend ten thousand dollars, if necessary, in improving his machine and giving it a grace and beauty which would detract nothing from its utility, and which could be imparted to all machines subsequently made, his action would command the most unreserved approval. We should advise every enterprising manufacturer to do so, feeling assured that he could not employ to better advantage as much of his capital as he may be able to spare. To further employ the illustration of the mowing machine, a maker of these useful implements might devote a great deal of attention to details which have not hitherto received due attention. It is notorious among farmers that while a mowing machine does not cost much when new, the repairs which have to be made to it are an endless and vexatious source of expense. There is something about them always breaking down or continually getting out of order, while other parts are, as the rule, absurdly strong and heavy. Now, why not apply a little science to the proportioning of such a machine, removing every ounce of metal when it is not needed, and adding strength where it is needed; substituting steel for iron where steel would render better service; improving the quality of the castings by experiments in the mixing of the best irons, and, in a word, doing all that theory and practice can suggest to make the machine perfect. Nor should art be slighted. It is a legitimate expenditure of money to beautify any article of utility, and science and art should co-operate in the proportioning of every part of a machine. A thing which is theoretically and practically perfect will always be beautiful in itself considered, and true art will make it attractive to the eye, while false art—or rather false taste in ornamentation—will destroy its inherent beauty of form and proportion and make it a burlesque. These remarks are general in their application. If manufacturers want to beautify articles which are not suitable objects for decoration, let them begin by making them as nearly perfect as articles of utility as they can by a liberal and well directed expenditure of time and money. This done, they may employ the artist in modifying the forms, giving grace to curves, delicacy to tapering parts, and, as it were, clothe it with an air of beauty and grace. He may then stop content, if the object be one of utility only. Excessive ornamentation is always ugly, and ornamentation out of place is barbaric.

We doubt if there are many manufacturers who have decided to follow a course similar to that proposed by the mowing machine man. If there are any such among our readers, we hope they will take a friend's advice and save their money for some more profitable investment. The most suitable, the most interesting and the most profitable of all the articles which will be exhibited at the Centennial will be those which show what we can do in the way of practical production. A \$10,000 mowing machine might be a very appropriate exhibit in the department devoted to jewelry and ornamental metal work, but it would be sadly out of place among agricultural implements. Nickel plated stoves with gold trimmings, carpenters' tools with pearl handles, saws with etched blades, and similar fancy articles, might be well enough in their proper places, but they should not be shown among the legitimate products of our foundries or tool shops. It is natural, and desirable, that manufacturers who place articles upon exhibition should endeavor to make something of superior beauty and excellence; but

they should not attempt to exceed this. No person wants to see gilding and varnish where they do not belong and have no excuse for being. If they look at mowing machines they want to see machines with which it would be possible to cut grass; if they look at stoves they want to see stoves in which it is possible to make a satisfactory fire; if at tools, they want to see practical tools with which a mechanic can work. Objects of beauty will have an appropriate place, but when it is attempted to ornament articles not properly susceptible of ornamentation, the result is an absurdity. Our advice to all intending exhibitors in the trade represented by this journal is, show the best goods you can make every day in the week in your own shop. Such goods will attract attention, and probably carry off the honors in competition with articles made only for show. If you call upon the electro-plater, the gilder or the engraver to help you out, you will be exhibiting their skill and not your own, and no one will accredit you with honesty in the matter of your exhibit except such as rank your intelligence a great deal lower than you would consider complimentary.

The Stove Manufacturers' Association.

The seventh semi-annual meeting of the National Association of Stove Manufacturers will be held at the Lindell House, St. Louis, on the 9th and 10th of this month. During the comparatively brief period of its existence, this association has been the means of accomplishing much good. Under the skillful direction of Hon. John S. Perry, who occupied the presidential chair for three years, the association safely tide over the difficulties and dangers which menaced its somewhat feeble life when first organized. Local and sectional jealousies were overcome, distrust gave place to confidence, and commercial rivalries became more generous and friendly than ever before. By mutual consent, but without the imposition of any onerous obligations, the trade agreed upon a scale of prices and a method of doing business which placed a check upon the ruinous competition which had formerly been engaged in among manufacturers, large and small. There was just as much competition then as before, but it was more friendly and less disastrous in its consequences. If any expectations were entertained of forming an association which should control the market price of stoves, and create for its members a monopoly of the market, they were disappointed; but a far greater and more permanent advantage has resulted from bringing the stove manufacturers into intimate and friendly intercourse. From the exchange and comparison of ideas and experiences, those who have attended the meetings have learned much of value to them, and we doubt if there is one member of the association who does not feel that it has been of direct advantage to him in his business, beside affording him pleasure in social intercourse.

At present the association is stronger than ever before. Its membership has steadily increased until it includes, with a few exceptions, all the houses of any standing in the trade. Its president, Mr. S. S. Jewett, of Buffalo, enjoys in a marked degree the esteem and confidence of the trade. The meeting next week will probably be well attended, and an interesting and harmonious session may be expected. Matters of interest will be brought before the meeting for consideration, and action will probably be taken on several important questions. It is also anticipated that an unusual effort will be made to entertain the members and guests. The well-known hospitality of the manufacturers of St. Louis insures a generous reception and a hearty welcome, and it is intimated that a trip to the Iron Mountain will be one of the features of the entertainment. Altogether, the occasion promises to be one of unusual interest, and it is to be hoped that all the stove manufacturers who can attend will do so.

Recent Developments in the European and American Lead Markets.

The gradual rise in the European lead markets since the middle of April has called forth a good deal of comment on the other side, and has remained difficult of explanation until quite recently, when the principal cause which has brought about the steady advance came to be better understood.

It will be remembered that, during the latter part of last year, lead advanced by degrees in the London market some three to four pounds sterling per ton, but that with the commencement of the present year a contrary tendency had set in, producing a decline of two pounds, till the metal righted again in April, and has recovered a pound to 80/- since. The decline

in January was brought about partially by the expectation that the political troubles in Spain would soon cease, and in part by the increased receipts of lead from there at Marseilles and Southampton, which seemed to lend strength to the supposition that peninsular production was indeed on the eve of a rapid recovery. Nor were these latter surmises at all exaggerated. On the contrary, the annual reports of English mining companies in Andalusia fully endorsed these views, and hastened the downward tendency for a while. All the greater was the surprise subsequently, when the market gained strength, and soon after a slow but steady improvement set in, which has continued ever since. The season was backward on the other side, the metal trades on the whole languished, and the demand for industrial purposes was extremely moderate, yet in spite of the heavy arrivals the lead accumulation that had been apprehended did not occur.

It has been since ascertained that the various governments have been steady purchasers for purposes of armament, each buying a moderate quantity at a time, without making much noise about it, but remaining in the market. When the late slight war cloud arose, they began to operate more extensively, and the improvement in the metal made corresponding strides. These government purchases of lead in Europe have that much good in them, that the lead thus acquired is as good as absorbed for ever, and not apt to be returned to market, as has been the case within the past twelve months with the government surplus here. There is, unfortunately, no prospect of permanent peace in Europe. Lead once converted into bullets for purposes of war remains in that state till finally picked up from the field of battle. What had to be bought for armament has now, in all likelihood, been taken, and the lead markets on the other side now await the demand for industrial purposes, which, according to the latest reports, manifests itself but slowly.

Spain is now sufficiently restored to her productive capacities in Andalusia, to be able to turn out 65,000 tons during the current year. Unless, therefore, the war demand should be actively resumed, or consumptive requirements be greatly increased, it seems evident that the present enhanced value of lead cannot be easily sustained, if left to the ordinary influences of a trade demand, i. e., if not taken charge of by speculators, which is rarely the case, lead not being considered a speculative article, except under extraordinary circumstances, not now apparent. And, beside, people in Europe are not given to speculation just at present, most of their ventures thus far this year having ended in disappointment and loss, and the failures, in consequence of the financial crisis on the East Coast of South America, being both heavy and frequent. Lead will consequently soon be handed back, in all likelihood, to the ordinary influences of a trade demand and supply on the other side, while here we have the same problem before us.

Our own lead consumption mainly depends on briskness in the building trade. The decline in rents this spring, as well as the general dullness in business still observable, have held out few inducements for capitalists to engage in building operations, notwithstanding the abundance and cheapness of money. The conclusion is, therefore, easily arrived at that we shall have dull times early in summer in the lead business, if we are to judge from the apathy of the past few months.

While, therefore, present appearances do not favor the supposition that we are approaching a period of activity during early summer in the lead market, we have to rely on the fall trade, which in this metal usually manifests itself in August, when manufacturers lay in their supplies for their winter consumption, and by that time stocks will probably have attained their maximum, and values will have settled down to a reasonable figure to warrant the anticipation of requirements.

Although mining in the West has been much hampered and retarded through the severity and length of winter, the various locations are now at work, and production is proceeding on an ample scale. Large as it was last year, there is no reason to suppose that it will be any smaller this year. On the contrary, the accounts received for the past six weeks promise a large production. Under these circumstances the ruling of comparative high lead values is out of the question, and the readiness with which several receivers here have of late met the market, leads to the conclusion that they will continue sellers, while the stagnation lasts. Toward September and October legitimate consumption will have had time to regulate the position of the metal without an effort, merely through the operation of exhausted supplies in the hands of dealers and consumers.

Coal and Iron in the United States.

Notes of a Visit to Coal and Iron Mines and Iron Works in the United States.

BY MR. T. L. BELL, F.R.S.

Of the entire production of iron in the United Kingdom in the year 1871, it may be said roughly that one-half was exported to foreign countries, and of this half, the United States of America received one-fourth, or something like 750,000 tons.

In the year 1874 this important figure was reduced to 130,000 tons. Accounts had reached England that the producing powers in pig iron of this, our most valuable customer, had risen, during the period in question, from about two and a half millions to four millions of tons.

It will be in the recollection of all that, between 1871 and 1874, iron of all kinds rose to an unusually high price in this kingdom. It therefore became a matter of great interest to the British iron masters to learn whether this unprecedented growth in the American iron works was due to the stimulus of our own excited markets, and whether the increase could be actively employed when iron fell in value to the price which experience had accustomed the world to pay for this commodity.

At the meeting of the Iron and Steel Institute held in Liege in 1875, invitations, remarkable for their courtesy and earnestness, were received, requesting our members to visit the mines and iron works of the United States in the following year.

That which at the time was impossible for the Institute to undertake, was not a matter of innumerable difficulty to myself, and, since my return, I have been asked by my colleagues on the council to communicate the general impressions produced on my mind by what I saw on the other side of the Atlantic.

Before entering upon this task I would, with your permission, avail myself of this first opportunity of announcing publicly that those promises made by Professor Raymond, on behalf of his fellow countrymen, were, so far as my own experience goes, more than realized.

I listened with feelings of the greatest satisfaction to the numerous and earnest recognitions of the valuable services which had, in the opinion of American iron masters, been rendered to the progress of the science and art of our branch of metallurgy by the labors of the Iron and Steel Institute. May I add that my love for my own country, as well as my pride at belonging to its body of iron masters, were equally flattered by hearing the people, as well as the sovereign and government of Great Britain, alluded to in terms for which the word veneration is the only proper term which occurs to my mind. The recollection of this, together with the generous cordiality of my own reception, will forever keep alive in my own breast a vivid reminiscence of my visit to the kindest of friends in the United States.

I cannot, without exposing myself to the charge of egotism, dwell at greater length on the marked distinction with which I was everywhere received, both by public bodies and private individuals, and if I allude to it once more, it is only that the members of the Institute over which at that time I had the high honor of presiding, may know that even an unofficial visit of their representative was regarded with so much favor.

TRANSPORTATION.
In the manufacture of an article like iron, requiring so large a weight of raw materials, the distances which separate the latter, the means of bringing them together, as well as the conveyance of the product to market, constitute important subjects of investigation.

The vast area of the United States places at the disposal of its inhabitants enormous mineral wealth, but the different geological districts, corresponding in immensely with the country itself, render it necessary to carry the produce of the mines over distances quite unknown in this country.

For the purpose of this communication, we need not trouble ourselves with any portion of this great continent west of the Rocky Mountains. Commencing at a distance of about 500 miles from the Atlantic seaboard, in the 34th parallel of north latitude, is the formidable chain of mountains, the Alleghenies and their offshoots, which, as they advance northward, approach nearer and nearer the sea coast.

For all purposes of inland navigation, the rivers east of this mountain range, such as the Hudson and Delaware, are of moderate dimensions, comparatively speaking, and command, in consequence, but a limited surface of country. West of the Alleghenies lies the largest plain in the world, embracing 134 millions of square miles, all drained by one river, the Mississippi, and its tributaries, the Missouri and Ohio, with a host of smaller confluent.

The volume of water flowing down the numerous channels which drain the basin of this magnificent river, affords immense facilities in the way of transport. An instance of this may be quoted the conveyance of coal from Pittsburgh down the Ohio. 20,000 tons of this mineral are shipped on board a flotilla of flat bottomed boats conducted by one steamer and carried for a distance of 1600 miles at something under 1/- per ton, which includes the cost of bringing back the empty barges.

In both river systems, east and west of the Alleghenies, when it became a question of their waters in connection with the manufacture of iron from pit coal, canals had frequently to be dug to connect the mineral fields with each other, owing to the direction of the natural water courses. Occasionally, the difficulties arising from rapid differences of level are unusually serious. In one place near Stanhope, a canal is cut at a distance of 500 to 600 yards, 170 ft. below it. The inclination of the surface is thus too steep to permit the service of locks, and hence the barges, holding 70 tons of coal, are run into a cradle, drawn up by means of a turbine from the river, and launched into the canal at the head of the incline.

It would appear that from some cause or other, the extension of cultivated lands and removal of forests being regarded as the true ones, the value of the American rivers in some instances has become materially lessened in recent times. Thus, but a few years ago, a line of steamers plied daily on the Ohio from Pittsburgh to Cincinnati. Owing chiefly to occasional deficiencies in the depth of water, these have been discontinued, and the river, with sometimes 60 feet of water in its channel at Ironton, was only navigable there by very small steamers drawing 2 feet or 3 feet of water.

The entire question of internal inter-communication of the United States has experienced great changes by the enormous development of the railway system. The Hudson River, which is accessible by the Great Eastern for 75 miles above New York, has a double line of rails running alongside its stream beyond the city of Albany. Thus the locomotive has not only in many cases displaced the marine engine, but it has brought mineral districts into connection with each other, which, without it, would, in a great measure, have remained useless. A limited quantity of charcoal iron could be and was produced from the rich ores of Lake Superior, the Iron Mountain of Missouri, and Lebanon in Pennsylvania; but the quantity would have remained insignificant had the rail not enabled these minerals to be conveyed to the coal of the Shenango and Mahoning valleys, and to those of the Lehigh, Delaware, Ohio, and others.

Under these circumstances, it may be useful to Paper read before the Iron and Steel Institute.

to dwell for a few moments on the question of the American railway system, which has grown into dimensions far exceeding those in our own country, the land of its birth.

According to Poor's "Manual of American Railways," we had in this kingdom, at the end of 1873, 16,082 miles of lines of road. Against this the United States had at that time laid down 70,651 miles of road.

In the United Kingdom, the average cost per mile was £26,582, while in the United States it only amounted to £11,500. No rigid comparison can, of course, be drawn from these figures, owing to the extent of single line being very different in the two cases. There are, however, two serious sources of expense connected with their formation, in which our American friends enjoy great advantages over ourselves; they have not had to fight their way inch by inch—often at an enormous outlay—in obtaining legislative authority to construct their railways, and they have not to pay, as we have occasionally to do, exorbitant prices for the land required for the works. Of course, the conditions in the two countries are very dissimilar; but, looking at the overwhelming importance, particularly in an industrial community like our own, of having not only the most perfect, but the most economical means of locomotion, cheapness of construction cannot be overestimated.

Against the advantages just named, the railway companies in the United States have had to contend with scarce, and therefore dear capital, with all materials, save timber, far more costly than with us, and with the very high rate at which imported labor had to be paid. They have sought, and often very successfully, to mitigate those drawbacks by adopting less expensive modes of accomplishing the objects they had in view, than have been considered requisite in a more settled country such as our own. It is true the results have been such as would scarcely have satisfied the jealous eye of a government inspector before sanctioning the opening of a new line in Great Britain; but in America the convenience of the many is allowed to override the possible injury to the interest of the few.

It may be interesting to know, on the same authority as that already quoted, that in the United States the working charges amounted in 1873 to 65.1 per cent. of the gross earnings, against 53 per cent. in this country, and that the average net receipts in the former case were 4.55 per cent. on the entire cost of the railways, against 4.59 per cent. with us.

The rates paid for carriage of ore and coal vary very greatly, in some cases as much as 15¢ per ton per mile being charged for distances as great as forty miles, while in others very little above one-third of this sum was spoken of as the price at which some companies were willing to contract. In the latter case, however, the line was in an undeveloped district, and the authorities are, in consequence, very solicitous to draw capital for the establishment of industrial enterprises.

After these preliminary remarks, I will now ask your attention to the geographical position and general nature of the different materials required in the manufacture of iron in America; and, first in order, we will consider the subject of the fuel consumed in the process, beginning with that obtained from the vast forests of that country.

CHARCOAL.

The English traveler has not far to journey in the United States before he discovers that trees are held in much lighter estimation than that with which he has been accustomed to regard them in his own country. On the banks of many of the rivers, or in their beds, he may see large trunks partly embedded in sand or mud, where they lie till they rot, unless carried further down stream by the next flood. On one occasion I observed that trees of considerable dimensions were mouldering away alongside the railway, to construct which they had been cut down.

This timber, as it stands in the woodlands of America, has but little commercial value; and as the forests often furnished the most accessible source of fuel, charcoal in the earlier history of its iron trade was exclusively used in its blast furnaces. So recently, indeed, as 1854 one-third of the pig iron produced in the United States was smelted in charcoal furnaces. Since that time the annual make of this quality of iron has risen from a little above 300,000 to a trifle above 500,000 tons, but this quantity now represents only one-fifth of the entire make. It therefore still constitutes an important portion of the whole, and is largely used in the Bessemer steel works, for the manufacture of railway carriage wheels and for other purposes where an extra price can be afforded.

The actual money paid for the timber as it stands must often be insignificant, seeing that thousands of acres of forest can be bought, land included, for three or four shillings an acre. Of course, the establishment of blast furnaces in its vicinity increases the value of its contents, and then the wood is sold in *stubs* under the name of stumpage. In one instance, in Missouri, 7 cents, or about 3½¢, was paid for a cord of 128 cubic feet as it is piled. The cost of 100 bushels of charcoal in the case referred to, was as follows:

Stumpage on 2½ cords of wood, at 7 cents	16	0	7
Cutting timber 2½	50	12	5
Cost of burning 1½ cents per bushel	4	35	16
Leading charcoal to furnace, 1½ cents	1	66	3

The charcoal weighed in this case 19 lbs. to 20 lbs. per bushel, so that with wood at a very moderate price we have the charcoal laid down at the furnace at a cost of fully 30¢ per ton.

The following gives an idea of the cost of this combustible in other places, delivered at the furnaces:

In the Lake Superior region.....	23	to	50	per ton.
Kentucky.....	24	to	30	"
Missouri.....	21	to	26	"
Tennessee.....	21	to	26	"
Alabama.....	20	to	30	"

The cost of the charcoal is, of course, materially affected by the expense of transport; 2 to 5 miles is a common distance, but occasionally it is much greater.

The quantity of timber obtained, as might be expected, from an acre of ground differs considerably, 30 cords in one case being given and 40 to 45 in another. To produce 100 bushels of charcoal, 2½ cords of wood are used, but the bushel of 2700 cubic inches varies considerably in weight, according to the wood employed.

I may here observe that the system of weights and measures employed in the American iron works is one of those few things which our relatives in that part of the world have done badly. Their currency of dollars and cents is a proof of a correct appreciation of the value of the decimal system; but not content with introducing our unmeaning ton of 20 cwt. of 112 lbs., they have two distinct tons, one the same as our own, and a second of 2000 lbs. In one part of the United States pig iron is sold by the one, and in another by the other ton. The same applies to coal and coke, except where, as often happens, they are sold by the bushel, this measure of coal being considered to weigh 83 lbs., and of coke 40 lbs. Malleable iron, on the other hand, is brought to market generally by the lesser ton, except rails, which are sold by the English ton.

To return to measure as applied to charcoal, the average consumption for a ton of pig iron may be taken at 110 bushels; hence, for the 500,000 tons of charcoal pig manufactured in the States, there will be consumed 55,000,000 of bushels of charcoal, and assuming 30 cords

of wood to be the produce of an acre, we have 1200 bushels of charcoal from this area. It would, therefore, appear that to provide the fuel for the charcoal furnaces now in operation in the United States, 46,000 acres of timber fall annually to the axe.

Assuming a bushel of charcoal to weigh 22 lbs., the weight consumed for iron making will be about 550,000 tons a year. Calculation shows that, after making a proper allowance for waste, less than 200 acres of a 4 ft. s. am of coal in the county of Durham would produce the same weight of coke as is obtained from 46,000 acres of American forest.

The time necessary to reproduce the growth of timber was stated to vary from 20 to 30 years. Taking it at 25 years, we have 1,150,000 acres of land as being required for charcoal purposes, an area which brings home forcibly the cost of conveying the fuel to the 189 furnaces engaged in smelting iron by its means.

Doubtless this extent of forest, great as it is, forms but an insignificant fraction of the 389,000,000 of acres of timber lands which cover various portions of the vast territory of the United States. Nevertheless, in many situations the growing scarcity of wood has already aroused the attention of the government to the circumstance, and a commission from the House of Representatives has recently reported on the position of the nation in respect to the want of care in the treatment of woodlands.

Leaving those sources of fuel which are being formed, as it were, in our own time, I must pass on to those in which generation after generation of vegetable life growing upon the wreck of its predecessor in the early history of our planet, have furnished the coal deposits in America, and which in abundance have probably no parallel in the world.

In them is to be found every form in which coal is familiar to us, from the one which is richest in volatile constituents to the almost pure carbon of the anthracite. But pre-historic vegetation has stored up the United States fuel not only in the solid state, but also in the other two conditions, in which we recognize matter as it constitutes our globe.

More than one case came to my knowledge where private houses are heated and lighted by hydrocarbon gas obtained by merely putting down a bore hole in the ground, but the most remarkable instance of utilizing gaseous fuel is that of the Iron City and Siberian Iron Works, near Pittsburgh. From a 3-in. bore hole, 1200 ft. in depth, and within a few hundred yards of the establishment, issues a constant stream of light, carbureted hydrogen at a pressure. I was informed that it is not less than 100 lbs. per square inch.

It does this in such quantity that in the works, neither for puddling, reheating nor motive power, do they use any other description of fuel. Next, however, to solid coal in importance is the liquid form of hydrocarbon known as petroleum or coal oil. The discovery and application in quantity of this substance dates but a few years back. At that time people rushed off to the oil wells as they previously had done to the gold diggings. Labor and material commanded fabulous prices, 25 or 30¢ a day was paid for the hire of a cart and a pair of horses, and a ton of coal for their engines brought the same money. One fortunate landowner who had an estate of 70 acres worth about £300, received, according to report, in royalties, from oil springs sunk upon it, as much as £50,000.

The process of "striking oil," as it is called, is not a difficult one, that is, if oil is there, respecting which there is a great deal of uncertainty. A bore hole is put down, varying in depth from 300 ft. to 600 ft., till they reach the oil stratum, which usually consists of a bed of gravel. From this, in some instances, the oil flows naturally to the surface; in others a pump, having a diameter of about 2 in., is used for bringing it to the surface. The motive power is supplied by a small steam engine, not unfrequently worked by the combustion of gas which issues from the oil-bearing strata, found, it may be remarked, lower, geologically speaking, than the coal measures themselves.

The question of the duration of these natural oil springs at once suggests itself. Instead of these deposits of liquid fuel stretching over a vast expanse of country, they clearly occupy spaces of limited extent, and are, comparatively speaking, speedily drained of their contents. Thus, many of the Oil City wells, instead of being pumped continuously, as was the case a dozen years ago, are exhausted by an hour or two's work in the day, affording only two or three barrels of oil, which collects during the 24 hours. New discoveries, however, are being made, so that the total produce of the country, I believe, is equal to, if not greater than, that at any former period.

The purification of the crude oil for illuminating purposes has given birth to enormous industrial establishments, one of the most remarkable of which I visited in the city of Cleveland. Time will not permit me to do more than state that in it 420,000 gallons of refined oil are distilled every day, and sent all over the world in 8000 well-made casks of oak wood, all of which are manufactured on the premises, in what is probably the most extensive cooage in the world. Within its walls 1200 men and boys are engaged, their exertions being supplemented on a large scale by mechanical agency.

COAL.

I now come to consider that variety of fuel, I mean pit coal, without an abundant supply of which no people can long hold a position of any importance as an iron manufacturing nation.

Great as is the superficies of the territory which forms the subject of this communication, it may be doubted whether there is any similar area in the world in which a larger proportion of the surface is occupied by coal-bearing strata than is to be found within its boundaries. They are three in number, consisting of:

1. An Eastern district, commencing in the State of Pennsylvania, passing through the States of Ohio, Maryland, Kentucky, West Virginia, Tennessee, Georgia, and terminating in Alabama..... Sq. Miles. 58,737
2. A central district occupying a considerable portion of the State of Illinois, and extending into Indiana and Kentucky..... 47,138
3. A western field situated in the States of Iowa, Kansas, Missouri, &c..... 64,487

Beside these, there is a small patch of coal field in Michigan, which, however, as far as it has been explored, contains only thin and unworkable seams. For these reasons it is not taken into the account. This, and some doubtful ground in Arkansas, Texas and others, bring up the total area of the coal fields in the United States to 192,000 square miles.

It seems to me that these areas are probably, in point of productive powers, a little overestimated, inasmuch as running through them are numerous and very extensive valleys, from which the coal has been partially or entirely washed away. There remains behind, however, after making ample allowance for losses by denudation, an enormous available area, against which the 8000 square miles of coal formation in the United Kingdom becomes, in point of extent, a very insignificant stretch of country.

ANTHRACITE.

In our own country, where this variety of fossil fuel occupies so small a portion of the coal-bearing strata, we can form but a faint idea of the important position it occupies in the United States, where last year, out of a total production of 45½ million tons, nearly 23

millions consisted of anthracite, and out of 2½ millions of tons of pig iron smelted, about one-half was the product of furnace burning this variety of coal.

The country in which this remarkable deposit, for a practical purposes of our inquiry, is found, lies on the northeast corner of what I have designated as the eastern district of the great American coal fields. It is split up into three parts or sections, but lying at no great distance apart. Their superficial area is comparatively small, the united measurement being estimated at 47 square miles. That which they lack in extent of surface, however, they make up for in the quantity of coal they contain. In one locality I visited there were three seams, having a thickness of 13 ft., 15 ft., and 18 ft., respectively, but in some cases they exceed these both in number and thickness.

From the position which these beds of anthracite coal occupy, it would appear as if, after their original formation, an enormous amount of lateral compression had been experienced by the districts in which they lie. This force has raised the strata into a succession of waves, as it were, the slopes of which vary from an angle of 30° to 45°, and occasionally descending to a depth of 200 to 250 fathoms or more. In some cases this compressive power has been so great as to have forced one ridge back over its neighbor to such an extent as to convert what is the floor of the seam in one place into the roof at another, and, from a similar cause, the quantity of coal which has accumulated at the anticlinal axes of some of these coal undulations is so great as to afford a face of 40 ft. to 60 ft., or even more, in thickness. In some cases denudation has carried off not only the sandstones and shales, but a portion of the coal itself, in which case, the bare edge of the seam either comes to the clay or to the surface, and the thickness of the latter of the surface. Where the anticlinal axis has not been removed, the coal is sometimes quarried, and in one instance near Mauch Chunk, in the Schuylkill district, I inspected an open quarry of coal 10 acres in extent, from which, it is said, 850,000 tons had been excavated, the face of the seam having a height of 70 feet.

The seams of coal in the anthracite region lying at such a slope, renders it necessary to resort to peculiar appliances for their extraction, neither perpendicular shafts nor horizontal drifts being suitable for the purpose. A powerful engine is placed on the surface, and an engine plane is sunk through the coal itself, varying, of course, in steepness with the inclination of the bed, up which the mineral is drawn. The winding engine, however, instead of merely lifting the coal to the surface, is so arranged that the produce of the mine is raised to the top of a gigantic mass of timber framing, known as the "breaker," the use of which is rendered necessary from the nature of the coal itself.

Anthracite, as we all know, is extremely close in its texture, and requires considerable force to fracture it. At the same time, it is difficult of ignition, and can only be kept burning in fires of moderate size, by having a large surface exposed to the action of the air. The labor of breaking down a large block of coal and the waste in small, which is practically worthless, would be so great that the coal owner performs this duty for the consumer, by passing the mineral over and through the breaker, which at the same time enables him to remove slates and other impurity by hand picking, and by a current of water.

The largest blocks, known as "lump" coal, are chiefly consumed in the blast furnaces, and the others, known as "broken," "egg," "stove" and "chestnut" coal are employed for domestic purposes. The "stove" is that used for domestic fires, and commands the highest price; but the extreme difference in value in all kinds is comprised within 3/6 per ton.

Practically, anthracite coal may be regarded as a natural coke, seeing that it often contains as much as 93 per cent. of solid carbon. It is, therefore, easy to comprehend what would be the position of an iron master who, instead of digging out 100 tons of coal in order to obtain 60 or 65 tons of coke, no richer in combustible matter than anthracite, had to deal with the 65 tons alone, in a mining point of view.

This, however, is far from being the actual position of the owner of an anthracite mine. It would be difficult to give any figures which would convey a correct idea of the actual condition of the things, different prices giving such different results. The height of the seams, and the nature of the "thrust," by working out the support of a roof lying at a right angle, is the cause of a greater loss in "pillars," than with us. This varies from 15 to 50 per cent. of the whole contents of the seam. Taking it at 25, which I heard stated was not an uncommon case, we have 75 per cent. of the actual bed of coal brought to the surface.

The mere act of breaking the coal, produces a considerable quantity of small, which, from the dense manner in which it lies on a fire, shutting out access of air, is valueless. As a consequence, in the vicinity of the older anthracite pits, are to be seen many acres of land covered with coal, which has passed through the screens bright and clean in its appearance, but is at present entirely unmarketable.

The loss arising from the cause first described is often very large, for inclusive of impurity picked out by hand or washed away, sometimes as much as one-half of the whole output is thus rejected. This proportion, however, is probably an extreme one, the loss from the cause in question being occasionally under 20 per cent. of the coal actually drawn.

The amount of the charge for royalty is very varied. The anthracite mines were opened out in 1820, when 365 tons only were sold. The intractable nature of the coal rendered its introduction one of such extreme difficulty, that nine years afterward the total weight brought to market was only a little above 100,000 tons per annum. It was not until 1839, however, that it reached 1,000,000, 44 years before it touched 10,000,000, but in the last 10 years it has risen to something like 24,000,000 of tons in one year.

A coal speculator, who was fortunate and sagacious enough, in the early career of this important branch of mining industry, to purchase coal lands, pays in the way of interest, little or nothing—in the way of royalty. A lessee of coal afterward paid about 1/10 per ton, but this, in recent years, has risen to 2/10, or even as high as 2/3.

The men engaged in the mines work from eight to ten hours per day, and I heard of a gang of three men sending as much as 32 tons of coal to bank in one shift. They are paid on a sliding scale according to the selling price of coal, upon which I shall have hereafter to remark. Under this scale, and during the recent period of wild excitement, the head of the gang earned as much as 30/ to 35/ per day, and even at the period of my visit, when the iron trade, the chief customer of these pits, was in a lamentably depressed state, the coal hewers were getting from 15/ to 19/ for a day's work.

At the present time, it may be assumed that the cost of delivering the whole produce of a mine of average excellence into wagoes, will be about 7/8 at the pit, and the selling price is about 12/ and upon this, also, I shall subsequently have a word or two to say.

BITUMINOUS COAL.

I visited other portions of this, so far as present production is concerned, most important of all the American coal fields—I mean the eastern one, Near Youngstown, in upper

Ohio, the so-called Briar Hill or Block coal is worked. In one pit, under forty fathoms which I descended, the seam was 5 feet thick, of clean coal, with a roof so good, that in the rocky ways no timber was requisite.

The royalty paid varies from 1/10 to 1/6. A hewer can work 4 tons a day, earning for this about 9/6. The coal is worked without making much small, at a cost of under 5/ per ton at the pit. Although the produce of this district contains a large quantity of volatile matter, as much as 30 to 40 per cent., yet this coal is largely used in the raw state in the blast furnaces situated in the Mahoning and Shenango valleys. The extent of ash, by analyses, was given me, in one case at 4.38, and in another at 8.40 per cent. The portion of this eastern coal field, near Pittsburgh, furnishes the celebrated coking coal which has been the cause of the great development of the iron trade in the vicinity of that busy town. The district known as Connellsville has an area of about 60 square miles. The seam is from 10 to 11 feet thick, and it lies so soft in the ground, that a man, without the use of powder, can shove a ton weight into the trams. The entire output of the mines is so generally converted into coke, that the cost of production is estimated on this article instead of upon the coal itself. Five and sixpence was given me, as the cost to put a ton of coke into the wagoes at the ovens, and the price obtained was about 10/6. The yield is about 92½ per cent. on the coal employed. For iron making purposes, I infer the Connellsville coke, as worked near the Monongahela River, stands highest of any of the United States. In the estimation of furnace managers. Nevertheless, both in hardness, and owing to the quantity of ash it contains, the Connellsville coke is, in my opinion, greatly inferior to that familiar to us all, which is produced in the county of Durham. I was informed that less than 10 per cent. as the proportion of ash, and from this it varied up to 17, and the sulphur from 1/4 to 1/2 per cent.

Some coke is produced from the unsaleable small coal of the mines near Pittsburgh, it being washed previous to the operation. In this way, coke, no doubt inferior in quality to the Connellsville, is obtained, and at a cost notably less than the level of the water, the neighborhood of the Monongahela River.

The cheapest coal I heard of was that obtained for supplying one of the largest iron works in the United States. Exclusive of royalty, it was delivered at the furnaces for something like 3/ per ton. It contains, however, 17 per cent. of sulphur and 7½ per cent. of ash. In the coke oven it yields 60 to 62 per cent. of weight, giving a product with about 10 per cent. of ash and 1 per cent. of sulphur. The earnings of the miners there amount to about 7/6 per day of eight hours' work.

The Ohio and Chesapeake Railroad runs down the Kanawha Valley, and, therefore, through a considerable portion of the field under consideration. The surface of the country being unmountainous, and the coal lying in many cases above the level of the water courses, the mines are worked by drifts. The seams differ in thickness, and in one I entered, near Charleston, on the Ohio River, was six feet, but in this was six inches of slate. A hewer can load in eight or nine hours four tons, for which he is paid 9/5. The royalty given me was low, viz., about 6d per ton; but anyone wishing to invest money in coal lands on the banks of the Kanawha, may do much better than this, for they can be purchased at something under a pound an acre, although, when immediately adjoining the railway, as much as five pounds per acre is obtained. In an agricultural point of view, land is valueless at present, being covered with forests, and from the steepness of the hills, probably at best could not be devoted to any other purpose. The cost of getting coal, exclusive of royalty, in this neighborhood, may be taken at 4/.

An analysis given me of the coal of this region was as follows:

Moisture.....	94
Volatile combustible matter.....	18.29
Fixed Carbon.....	75.87
Fixed carbon.....	4.90—100
Fixed carbon.....	93.55
Ash.....	6.15
Sulphur.....	30—100

Judging by those which came under my notice, I should have said these two must have been picked samples. It would seem, nevertheless, that the quality is really good, for I was informed that a ton of pig iron was smelted with 23 cwt. of the coke obtained from the coal of the Kanawha Valley.

In Northern Kentucky, opposite Ironton, the seams of coal range from 3 to 5 feet in thickness. A hewer works about four tons per day, getting for this 8/ to 9/6. The total cost per ton is about 4/6. The coal of this portion of the field, although bituminous, is sufficiently dry burning to admit of its being employed near the blast furnaces.

Near Knoxville, in Tennessee, at Coal Creek, I went into one of the coal workings. Upon 3½ to 4 feet of very good coal, somewhat resembling that of Briar Hill, is a friable shale from 8 to 12 inches in thickness. This causes a little trouble by getting mixed with the remainder of the seam. Each hewer works about 3 tons per day, the total cost, on a comparatively small output, being about 5/ per ton.

At Rockwood, lower down the valley of the Tennessee river, the coal is also excellent for iron making purposes, and is worked somewhat cheaper than at the price above named.

At Rising Fawn, on the Alabama and Chattanooga Railway, a new iron works is being constructed after the model of those lately erected in the North of England. Its source of coal is a seam 11 feet thick, situated in the Coosa field. Preparations are in progress for opening it out, so that little can be as yet said as to the expense of working. The fracture of the coal is wavy in appearance, easy to the touch, like talc, and, on compression, separates into thin plates. The chemist on the works informed me that it gives from 80 to 85 per cent. of coke, containing from 8 to 15 per cent. of ash, and a marked quantity of sulphur.

In the State of Alabama, there are outlying portions of the main coal field, known as the Black Warrior, Cahaba, and Coosa. The physical configuration of these districts, as I shall afterward have occasion to show, is an important bearing on the future prospects of their iron manufacture, which, in all probability, is destined to become an important feature in the industrial enterprises of the Southern States. The circumstance of their detached position renders accessible other geological formations, which, abounding with certain qualities of ore as well as flux, present advantages and conditions for the economical production of the metal rarely met with even in Great Britain.

The coal workings in Alabama may be regarded as in their earliest infancy. All I examined were but recently opened out. The total output of the Cahaba field did not, last autumn, exceed 150 tons per day from seams varying from 3 to 4 feet in thickness. One I entered showed a thickness of less than 3 feet. To the smallness of the production, the high cost given, 9/6 per ton, may be probably attributed. The miners were earning 6/7 to 7/6 a shift. I measured the coal face in one mine of the Black Warrior field. It gave:

Top coal, good.....	3	4
Bottom coal, good.....	1	2
Bottom coal, good.....	1	2
Total.....	5	10

A specimen of coke from the washed small of this working was bright and silvery. The work at this establishment was chiefly performed by convicts, whose services are farmed out by the State, and this may account for the cheap cost of production which was given me, being not much above 3/ per ton. The unfortunate criminals here, when working outside, are under the surveillance of watchers, provided with loaded firearms, and upon the premises is a kennel for bloodhounds, to track the runaways.

In the State of Georgia, I visited a drift, where, from a seam varying in thickness from 5 to 7 feet, they are worked 250 to 300 tons a day. This mine is also worked by convict labor. The cost of which, including all expenses, does not exceed 3/ per day—that of a free miner being nearly 9/6. A hewer will work 5½ tons per shift, and could, if he chose, do 7 tons. There are 40 coke ovens at work, at which the workmen receive 3/9 per day. The yield of coke was given at 67 per cent. of the coal employed.

The second coal field in the list mentioned is that situated in Indiana and Illinois. Although unable to visit the collieries of either, I enjoyed the advantage of learning from the lips of coal owners, as well as from my kind friend, Professor Cox, the State geologist, a very minute account of their resources. I had, beside, ample opportunities of examining personally the coal itself.

One of the block coal similar in appearance to that worked near Youngstown, Ohio. In structure it is laminated, composed of alternating thin beds of different kinds of coal, so that it splits easily into horizontal layers. On the other hand, joints running in a direction perpendicular to the bed render it easily worked in cubical blocks, and hence its name. The two or three seams which furnish it are from 3 to 4 feet in thickness, but, beside these, there are 8 or 9 of other varieties, one of which was mentioned as having a thickness of 11 feet.

The block coal is held in the highest estimation for iron making purposes. It contains about 60 per cent. of coke, is open burning, and is used raw in the blast furnace. A miner can work 5 or 6 tons in 8 hours, and can earn a high wage, as much as 16/ per day on this quality. The cost at the furnaces, which are close to the colliery, is under 5/ per ton. Slack, screened from the bituminous seams, can be purchased at such a moderate price, that coke can be manufactured at the price just named, or less. The block coal is remarkably free from sulphur; indeed, the iron made with it commands even a higher price than that made with charcoal, under the same ore in each case. The amount of ash in the coal varies from 1½ to 5 per cent.

In the Illinois district of this third coal field, six seams were mentioned, as varying from 2½ to 6 feet in thickness. It divides the immense advantage with the more northern portion of the field of being situated within half a dozen miles, in some places, from the magnificent waters of the Mississippi. On the Big Muddy River one firm works above 200,000 tons a year. Their hewers earn from 9/6 to 17/6 per day. At the period of my visit the coal trade was in a very depressed condition, a notice of reduction in wages had been given, and the miners, in consequence, had turned out, notwithstanding the very high rate of existing wages. The coal from this last-named district is not sufficiently good to be used alone in the blast furnaces; at all events, the furnace owners of Carondelet, near St. Louis, mixed it with Connellsville coke, brought from a distance of several hundred miles.

This hasty description must comprise all I have to say on the coal division of my subject. Firstly, because I in other visited nor saw any of the mines of the field mentioned as the third in a former part of this paper; and secondly, as far as I know, it is not employed in that branch of industry which more particularly concerns this Institute.

FLUX.

An inspection of a geological chart map of the United States, and of America, will disclose a vast extent of the carboniferous limestone formation extending beyond the confines of the coal fields which have just been described. In addition to this source of supply of flux to the blast furnaces, the Silurian rocks are frequently at no great distance from the pig iron works. In the case of Alabama, indeed, the coal formation may be said to rest upon this more ancient geological stratification. To a very limited extent, a limestone, containing as much as 30 per cent. carbonate of magnesia was being used, obtained, I presume, from the Silurian deposits. Magnesia with silica, and lime or alumina is no doubt very fusible, but having no affinity for sulphur, its use in the blast furnace is a questionable advantage. In the furnaces at and near Baltimore, the flux employed in the blast furnaces is of a very unusual description. As is well known, the Chesapeake Bay is famous for the abundance of oysters it produces. These are sent in such enormous quantities all over the States that the shells suffice not only to serve the purposes of the iron masters in that district, but are used extensively as a material for repairing the roads.

It may interest members to know that oyster shells contain as much as 95 per cent. of carbonate of lime, and thus other constituents which may be objectionable do not occur in very great quantities, as may be seen from the following analysis:

Carbonate of lime.....	95.01
Carbonate of magnesia.....	4.94
Silica, insoluble in acid.....	2.54
Peroxide of iron and alumina.....	3.33
Sulphuric acid (equal to 1/12 of sulphur).....	1.00
Phosphoric acid (equal to 1/13 of phosphorus).....	0.53
Soda.....	0.05

Reference to a table below will show, also, that oyster shells are, in Baltimore, a very inexpensive substitute for lime.

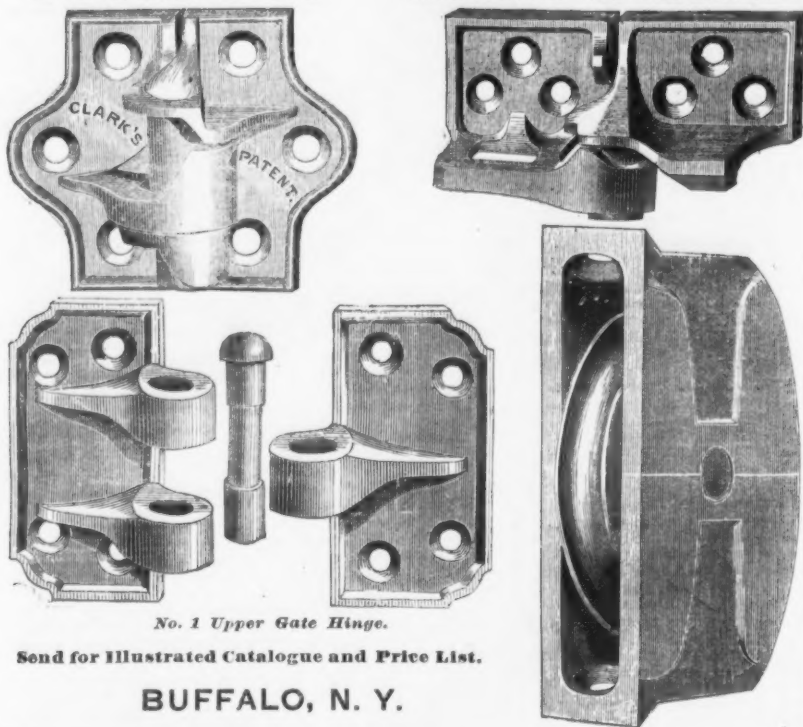
Looking at the extreme simplicity of the mining operations connected with obtaining limestone, it cannot be necessary to waste time by describing the methods of working it, which resemble identically those commonly practiced in our own country.

Instead of this, I shall quote, where I can, the quantity used to the ton of iron, and the cost of a ton of the limestone delivered at the furnaces, merely premising that the quantity employed, of course, varies with the ore, and the great fluctuations which will be observed in the cost arise chiefly from differences in the length of the distance it has to be conveyed.

District.	Cost per ton at furnace.	Quantity used per ton of iron.
Lake Champlain.....	2.9	1½ cwt.
Phillipsburg.....	2.10	12 "
do.....	2.9	20 " (containing 30 lbs carb. mag.)
Cleveland City.....	3.95	"
Youngstown.....	5.8 to 6.9	15 "
Pittsburgh.....	6.8 to 7.0	"
Harrisburg.....	4.0	"
Philadelphia.....	6.4	"
Kanawha Valley.....	4.8	10 "
London.....	6.0	"
Indiana.....	7.9	12 "
Chicago.....	7.6	15 "
Alabama.....	3.9	10 "
Tennessee.....	3.9	12 "
Albany.....	3.9	13 "
Troy.....	6.7	10 "
Baltimore Oyster Shells.....	64.	90 "

(To be continued.)

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Goods Stamped "D. R. BARTON & CO." are neither
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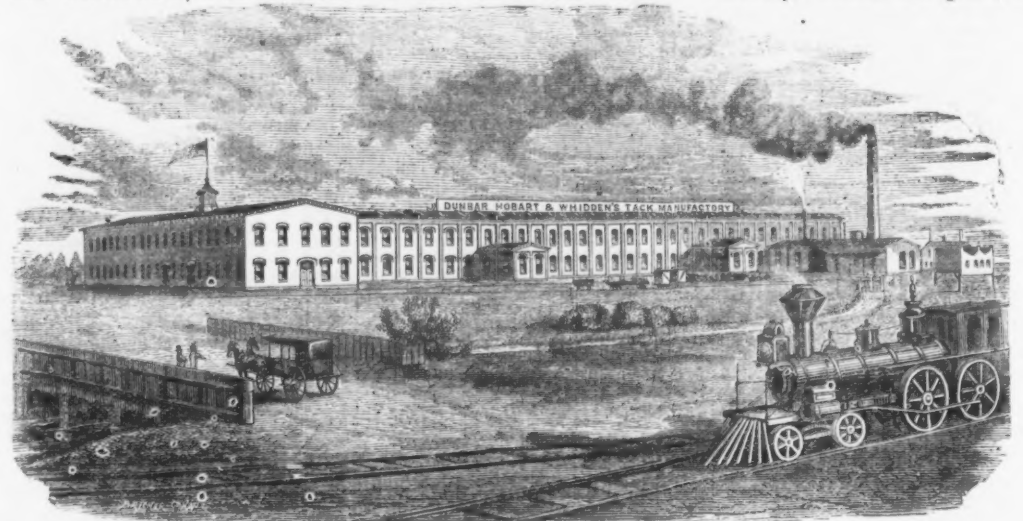
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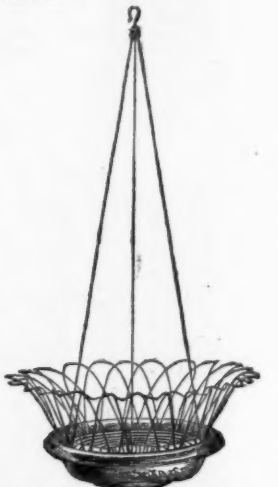
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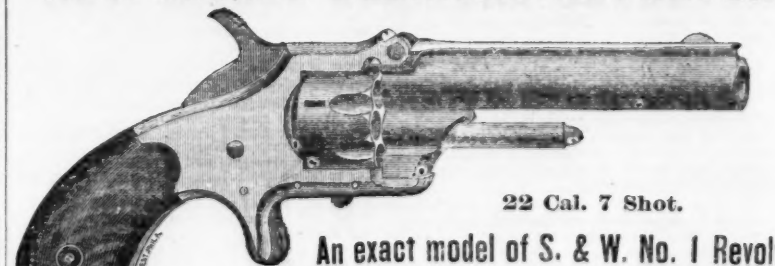
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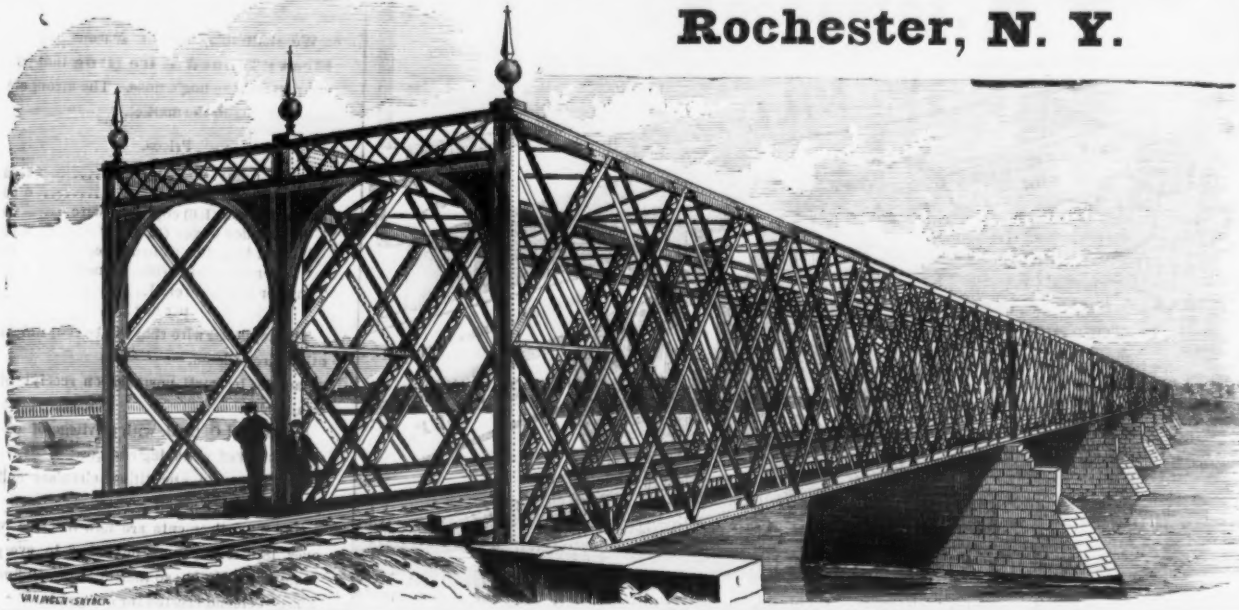
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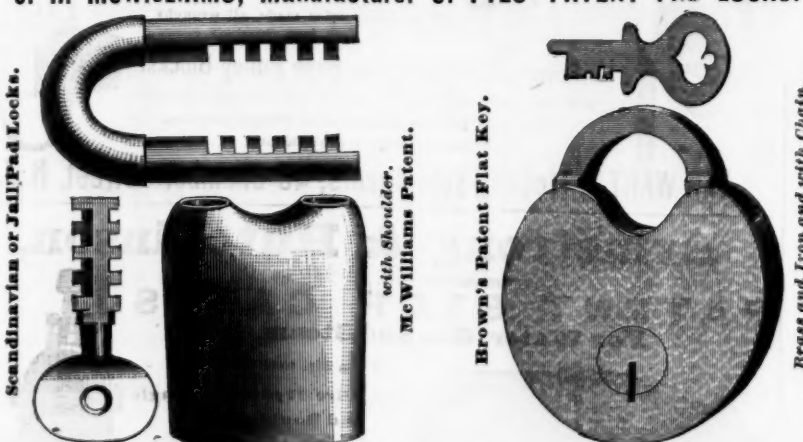
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The Law of Trade-marks and their
Analogues.

BY ROWLAND COX, ESQ.

V.

In determining whether or not there exists
such an infringement as will warrant the issuing
of an injunction, the adoption by the imi-
tator of the incidents that accompany the origi-
nal is usually a circumstance of very pro-
nounced weight. Especially is this true where
there is no technical mark involved; but merely
an allocation or aggregation, what has been
termed the analogue of the trade-mark. In
cases of this nature, the similarity or dissim-
ilarity of features which are wholly independent
of the words and devices are, in perhaps every
instance, of controlling effect. Thus, in the
case of goods which are sold in inclosures or
wrappers of any kind, or where a label or tag
is used, the shape, color and appearance of the
package, wrapper, label or tag, and even the
appearance of the goods themselves, are of
manifest importance. Indeed, as the question
where the analogue of the trade-mark is imi-
tated, is strictly one of sameness of effect upon
the eye, unless these incidents are closely copied
it will be at least inexpedient to resort to legal
remedies.

We here again meet a sharply-defined dis-
tinction between the true trade-mark and its
analogue. In the case of the former the inci-
dents alluded to are of but little moment. They
in no wise control the question, but serve only
to aggravate or lessen the turpitude of the
wrong.

The distinction will be made clearer by an il-
lustration. The following cut is, as a whole,



susceptible of protection, under certain condi-
tions, as the analogue of a trade-mark. If it be
supposed that it is printed upon green paper,
and that all its parts (which, however, is not
strictly true, the words "Cherry Heat-Welding
Compound" being susceptible of protection)
are open to the public except the name of the
manufacturer and the anvil, there would be
abundant room by the use of a like cut, printed
on green paper, to mislead incautious pur-
chasers, even if the anvil, and manufacturer's
name were not copied. This would be particu-
larly true if the shape and color of the package
were limited; but there could be no sufficient
ground for action, if the supposed partial copy
was used upon a label of different color, and
upon a package that was readily distinguishable.
In respect, however, of the technical trade-
mark, the anvil, the shape or color of the label
or package, would be of no practical conse-
quence. The use of the anvil in any possible
manner, in connection with the particular
class of goods, would be an infringement,
and this, even if every other feature of the
original label was so completely changed as to
prevent the possibility of confusion.

To further illustrate a point of exceptional
importance, let us suppose an original as fol-
lows:

JOHN JOHNS'

*

WHITE LEAD.

The following would be an infringement:



No one seeing the two could, by any possi-
bility, be misled. The names of the manufac-
turers are so conspicuous as to at once arrest
attention, while the trade-mark, the star, is
much less likely to be observed. But, as was
intimated in a former paper, the star is John
Johns' commercial signature, his property in a
true sense, and hence any use of it by another
is an actionable injury. And the wisdom of
the rule, like every other rule which pertains
to the science of law, admits of no question.
Purchasers know of a white lead which is dis-
tinguished by a star. Whoever, other than
John Johns, applies a star to his goods, holds
out that he is the producer of that which he
does not produce, and diverts a class of cus-
tomers to himself by what is at least a con-
structive fraud.

It must not, however, be inferred that, in the
absence of letters patent, the incidents are in
any respect the subject of a right of property
in themselves. A and his successors may put
up an article in a particular way, to the exclu-
sion of every one else, for centuries, until the
trade and the public come to know the produc-
tion, and to purchase it guided by the accepted
fact that no other person or persons make use
of a similar package. The impression may pre-
vail universally, and be acted upon as having
its origin in a settled right; and after the sup-
posed right has so obtained, B may come in,
and, adopting the peculiar package, sell his
goods, in effect, as the production of A and his
successors, without incurring liability in any
form. But if B should copy the trade-mark or
label employed by A and his successors, the
long uninterrupted use of the form of package
would be a strong circumstance in weighing
the probability of deception, and would make
an otherwise doubtful case a clear infringe-
ment.

In the case of the technical trade-mark, as
well as its analogue, there must be a mark, in
the narrowest sense of the word, or there will
be no foundation upon which to build.

Reasons for Using our Goods.

Hogs when ringed are prevented from rooting, and fatten quickly.

Pastures and clover fields are kept smooth and are not destroyed by the hogs rooting them up.

Feed lots in the winter are kept smooth, and corn that is otherwise rooted and tramped into the ground is saved.

The **Triangular Wire Ring**, manufactured only by us, is the only wire ring that can be inserted in the hog's nose with one grip on the **Ringer**, and is the only ring that will remain in a hog's nose, as it fits close, will not turn in for the joint to irritate the nose, is not liable to be torn out, and heals quickly.

No puncturing of the nose required to insert our ring.



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Ringers, retail\$1 00
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Rings per box (100) coppered wire 50
" per doz boxes (1000) " 3 00
" per box (100) tinned wire 60
" per doz. boxes (1000) tinned wire 4 00
Tongs or Huffers retail 1 25
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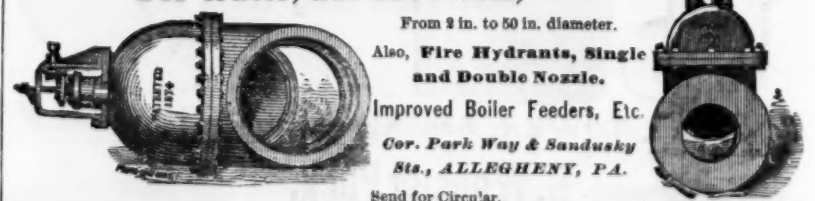
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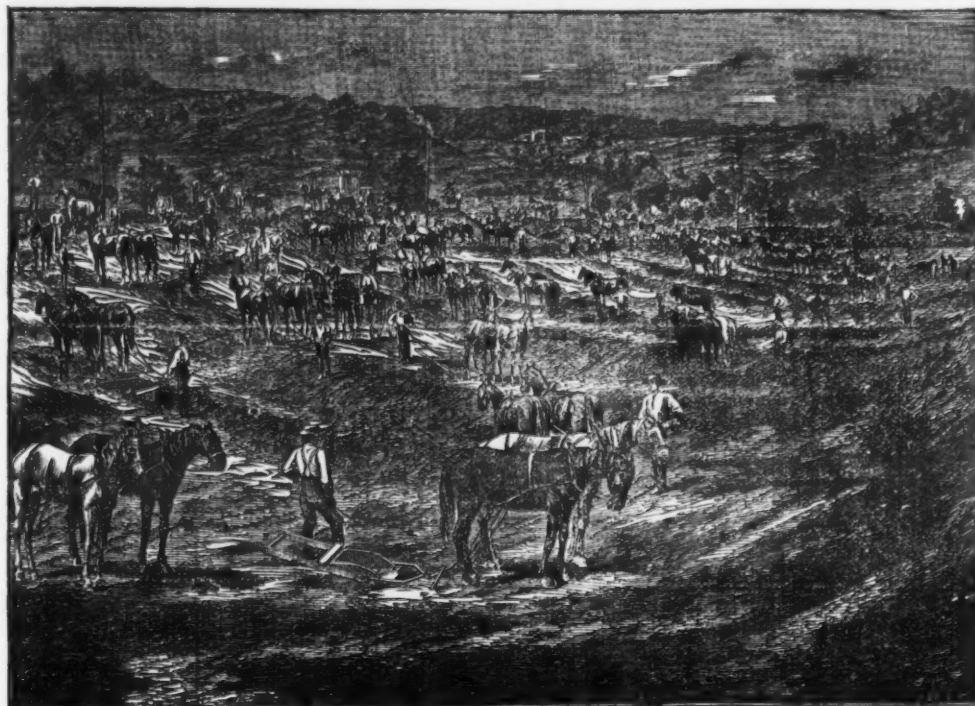
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DURABLE, STRONG, CHEAP.

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ARE ALREADY IN USE.

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TIME.—Rights itself after dumping its
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LABOR.—Only one man needed to do
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MONEY.—Does more work in the same
time than any others.

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"Automatic"



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combined, for Water-
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Washing Windows and
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In various kinds of wood, suitable for Store Fronts,
Private Houses, Offices, and School Partitions.

**The Best & Cheapest Shut-
ters in the World.**

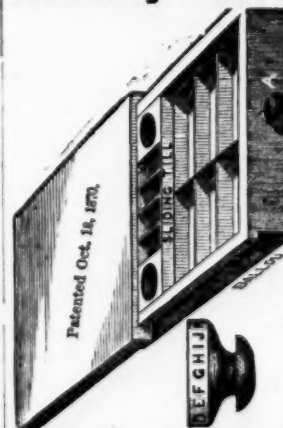
All Real Estate owners are invited to inspect them
at the factory,

218 West 26th Street, New York.

JAS. G. WILSON, Manager.

Chicago Office, 34 La Salle Street.

**EXCELSIOR
Money Drawer.**



The lock in this Drawer has twenty-six changes, and
is so constructed that an unauthorized person cannot
open it. The proprietor can change the lock, and all for-
mer knowledge is rendered useless to outside parties.

C. PIERPONT & CO., Manufacturers,
New Haven, Conn.
Semple, Birge & Co., General Western Agents,
10 S. Main St., St. Louis, Mo.

Science at the New Paris Opera House.

Under this heading *Nature* condenses from
its French namesake an interesting description
of some of the scientific appliances incorporated
in the construction of the great theatre recently
completed. The first difficulties to be
encountered related to the warming and ven-
tilation of so vast a space, complicated by the
changing conditions of emptiness and reple-
tion with spectators, alternate union and
separation of the atmosphere of the stage and
auditorium as the curtain is raised or lowered,
etc. To raise the temperature with sufficient
rapidity before the commencement of a per-
formance, and to provide for a renewal of air
at the rate of nearly 3,000,000 cubic feet
an hour, hot water and hot air furnaces are em-
ployed, 14 in number, and consuming daily
about 20 tons of coal.

To carry off the vitiated air, the upward
draught created by the central lustre is utilized
through several large conduits communicating
with different parts of the house, while fresh
air is admitted through openings measuring
from 24 to 30 square meters. To avert a far
too common source of danger to the per-
formers, the foot lights are ingeniously arranged
to burn upside down, their reversed glass
chimneys being connected with a transverse
pipe through which a current of air circulates
strong enough to draw the flame downward and
keep the metallic burner from becoming heated.
These and all the other gaslights in the build-
ing are so contrived that they can be suddenly
lowered for a night effect, without the risk of
extinguishing a single one. In a lower room
are contained gasometers of hydrogen and oxy-
gen for the oxy-hydric light, and a gigantic
galvanic battery of 360 Bunsen cells, the nit-
rous vapors from which are neutralized by
ammonia. From this battery wires aggregat-
ing nearly a mile in length are led to the stage,
where the intensity of the current may be
varied to produce different optical effects with
the electric light. In the opera of "Moses,"
by throwing this light into watery vapor, a
genuine rainbow is projected on the scene, and
numerous other brilliant phenomena are dis-
played. Throughout every department of this
magnificent building science seems to have been
brought to the aid of art; and the government
expenditure of 40,000,000 francs, which has
aroused the jealousy of the purely scientific
societies, has at all events resulted in showing
how advanced civilization may be concentrated
in a "mere place of amusement."

The puddlers at the Chesapeake Iron Works,
Harrisburg, are on a strike, demanding an in-
crease of \$1 per ton, or \$5.50, the rate paid to
Pittsburgh puddlers. Their employers show no
disposition to yield.

All the coal mines at Mineral Ridge, Ohio,
have suspended operations, while there is but
one furnace in blast.

Furnace Charging Apparatus.

The Lebanon Daily News says:

Messrs. Weimer & Birkinbine, of the Weimer
Machine Works, are at present engaged in the
construction of one of Mr. Weimer's improved
charging apparatus, of gigantic proportions,
for the Aetna Iron Company, of Ironton, Ohio.

The Aetna Company's furnace is 18 feet high
and 87 feet high, constructed on the Ferrie sys-
tem, now so successfully used in Scotland. The
mouth of the hopper is 14 feet in diameter, that
of the bell 7 feet 9 inches, or about equal in
size to that of four hoppers, as ordinarily con-
structed.

Messrs. Weimer & Birkinbine's apparatus
consists of an inverted hopper 14 feet in diam-
eter, in the sides of which are four openings,
through which the stock is introduced into the
lower hopper. These openings are closed when
the stock is being dropped by means of four
doors hinged to an annular ring revolving on a
suitable recess cast in the side of the cone, a
pair of air engines through a train of gearing
revolving the annular ring and charging doors.
The bell, which weighs 3½ tons, is operated by
an air cylinder 50 inches in diameter and 3 feet
stroke, by means of a beam composed of two
wrought iron plates 16 feet long and 3 feet
wide, supported on a cast iron fulcrum 9 feet
high resting on the edge of the hopper. The
entire apparatus will weigh upward of 30 tons,
and will be capable of lowering into the fur-
nace, without any escape of gas, from four to
five tons of stock at each dropping of the
bell.

The ordinary Weimer charger, as constructed
for our anthracite furnaces, is 8 feet in diam-
eter, weighs about four tons, and lowers, say,
one ton of stock at a dropping.

The massive proportions and bold designs of
the Aetna Company's charger is in keeping with
the well known reputation of the Weimer Ma-
chine Works, and is another of the upward
steps that is placing this firm at the head of the
iron industries of this community.

Griffith & Binks' Mount Clare Foundry,
Phoenixville, Pa., have work enough on hand
for a cast every day this year.

The abandoned coal bank of the Holland Coal
Company, at Iron Hill, Mahoning county, Ohio,
has been again put to work.

The Cleveland Rolling Mill Company's rail
mill is running full power, with eight heating
and five double puddling furnaces.

The lead pipe works of Gibson, Roberts &
Price, of Cleveland, are making from seven to
eight tons of pipe lead and ten tons of sheet
lead daily.

The Union Steel Screw Company, of Cleve-
land, employ 200 operatives.

New Patents.

We take from the records of the Patent Office of Washington the following specifications of certain patents lately issued, which will be found interesting:

IMPROVEMENT IN THE MANUFACTURE OF IRON.
Specification forming part of Letters Patent No. 161,630, dated March 30, 1875, issued to John F. Bennett, of Pittsburgh, Pa.

This invention relates to the manufacture of pig iron, and, more especially, to such as is made from materials that, in addition to the iron ore, contain a large percentage of impurities, such as silica, alumina, sulphur and phosphorus. By the general method of working now practiced this class of ore is smelted in the blast furnace in the presence of large quantities of limestone and an excess of fuel, caused by the necessary excess of limestone required to remove the silica, and, as a result, high temperatures are obtained, and large amounts of carbon are present, which are both inimical to the separation of silicon from iron. In fact, experiments have proved that the amount of silicon under favorable circumstances will run as high as from 8 to 15 per cent. This silicious iron or "blazed pig" is frequently produced by accident, even in working good ore, and is commonly produced where poor material is worked. It is difficult to work to advantage, and falls far below the usual market price of iron.

The first step of this process, based on the above, is addressed to the treatment of the ore in the blast furnace; and it consists in treating ores of the quality specified by reducing the amount of limestone ordinarily used, employing only so much limestone or other flux as will combine with the sulphur and be sufficient to reduce to a fluid slag such impurities, exclusive of silica, as cannot be otherwise reduced, allowing the silica and alumina to pass into the crude pig as silicon and aluminum. The silicon and aluminum, which would render the iron difficult to work, and the sulphur and phosphorus, which would render it what is termed "red-short" and "cold-short," are removed by a second step of my process, which consists in submitting the crude metal while fluid to the action of a neutral flame of carbonic acid gas for a varying time, according to the percentage of silicon present, the average being one minute for every one-tenth of 1 per cent. of silicon; and this is based on experiments proving that, up to a certain point, the decrease of silicon is marked by an increase of carbon. This last fact, viz., that the decrease of silicon is marked by an increase of carbon in the iron is the basis for a third step of my process, or, perhaps, what may be considered but as a continuation of the second step, viz.: Commencing with a pig metal containing a large per cent. of silicon, subject it to the neutral carbonic acid flame until the minimum of silicon remains, when the maximum of carbon will be present, whereby is obtained a carbide of iron which will melt at low temperatures, and is useful in the arts.

The process, as conducted with the protoxide ores obtained in Michigan, known as "Lake Superior ores," and which contain silica crystallized under the name of quartz, jasper, &c., in about the following proportions: Iron, 71 parts; oxygen, 27 parts; silicate alumina, 2-3 parts; iron, 46 parts; oxygen, 13 parts; silicate alumina, 2 parts; quartz or jasper, 39 parts, is as follows:

Heretofore in working the blast furnace with the first mentioned ore, 25 per cent. of limestone to every 100 of ore is sufficient to obtain a liquid slag. The second, containing 39 per cent. of quartz and jasper admixture, has been rejected, because it often required as high as 150 per cent. of limestone to the 100 of ore, and a proportionately large quantity of fuel. The intermediate grades of ore required limestone in proportion.

Proceed as follows: No matter how high the percentage of silica in the ore, add sufficient limestone to combine with the sulphur and other impurities, exclusive of silica, generally about 20 per cent. to the 100 of ore, seldom exceeding the 25 per cent. commonly employed for the better class of ores and the usual amount of fuel, reducing the ore so as to allow the silica and alumina to be reduced into the metallic state, and to pass with the crude pig metal from the blast furnace in the metallic state.

This metal containing the silicon and aluminum, tap from the blast furnace into a reverberatory or other suitable furnace previously heated either by the waste gases from the blast furnace, or in other well known manner, until the impure liquid metal covers the hearth to a depth of three or more inches. Then cause a neutral flame of carbonic acid gas to play or pass over the impure silicon pig for a length of time equal to about one minute for every tenth of 1 per cent. of silicon contained in the metal, the amount of silicon having been previously determined by the well known tests. For instance, a metal containing carbon 3-32 and silicon 3-72 would be affected about as follows, other things being equal: At the end of thirty minutes, 3-66 carbon, 1-60 silicon; at the end of forty minutes, 3-78 carbon, 7-98 silicon; at the end of fifty minutes, 3-56 carbon, 7-56 silicon—the latter indicating a point at which the flame is decarbonizing the iron, the silicon having been removed.

The elimination of the silicon may be accurately ascertained by the use of the spectroscopic, and will be completed when the jets of flame or "candles" issuing from the liquid mass cease to be those of burning silicon, and become those of burning carbonic oxide. In a short time the workman will become so well acquainted with the phenomena that he will distinguish the changes from looking at the surface of the liquid metal through a piece of blue or colored glass.

If the amount of silicon in the crude pig has been large, the result of the above treatment will be a pig metal having a large percentage of carbon in combination, tests having shown that the amount of carbon deposited is about equal to one-fifth of the silicon removed—that is to say, if the impure pig metal, when placed melted in the reverberatory furnace, consists of carbon, 3 per cent.; silicon, 5 per cent.; and iron, 92 per cent., it will, after the flame has operated upon it for 50 minutes, contain 4 per cent. of carbon, 96 per cent. of iron and traces of silicon, or rather silicic acid, mechanically mixed with the pig metal, and which will separate therefrom as a cinder if the metal is slowly cooled.

When it is desired to obtain an easily fusible pig metal, or one containing a large per cent. of carbon, proceed as follows: Make use of iron ores that contain or are commixed with large quantities of silica, such as quartz and jasper, and, if necessary, add to the iron ore silica (quartz), for the purpose of first producing an impure pig metal containing fifty per cent. of silicon, more or less. This impure pig metal treat as described—that is, by causing a neutral flame of carbonic acid gas to play over it while in a liquid condition for a time equal to one minute for every tenth of one per cent. of silicon present, which, in a pig containing fifty per cent. of silicon would result in a product containing ten per cent. of carbon. Of course, if this step of the process is commenced with a pig containing a higher per cent. of silicon, a higher carbide will be obtained, and by selecting a metal containing the proper amount of silicon to commence with a carbide of any desired grade may be obtained.

While silicon is being removed a portion of the sulphur and phosphorus contained in the impure pig metal is also eliminated. The saving in fuel and limestone, and in the wear and tear of the furnace, may be enumerated as among the advantages of the improved process.

Claim.—1. The process herein described, for manufacturing iron, consisting in first reducing the ore in a blast or similar furnace with the minimum amount of flux, so as to obtain a silicon iron, and then subjecting the impure pig metal to a neutral flame of carbonic acid gas for the removal of the silicon.

2. The process herein described for obtaining a pig metal containing a high percentage of carbon, consisting in first adding silica, such as quartz or jasper, to the iron ore, and reducing the admixture, so as to obtain an impure pig metal containing the desired amount of silicon, and then submitting the impure pig metal to a neutral flame of carbonic acid gas, so as to eliminate silicon and deposit carbon.

Special Notices.

Important to Manufacturers.
BISSELL, WELLES & MILLET,
Auctioneers and Commission Merchants, No. 15 Murray St., New York.

Solicit from Manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

Manager Wanted

for an Anthracite Furnace. He must understand his business thoroughly, including the supervision of steam blowing machinery and all repairs.

Address, stating experience, references and salary expected, **ANTHRACITE,**
Box 672, New York.

To Hardware Manufacturers and Importers.—A Travelling Salesman with ten years' experience in Hardware and Cutlery, canvassing Southern cities, is open for engagement June 15. Address, **TRAVELER, Box 1,**
Office of **The Iron Age,** 10 Warren St., N. Y.

WANTED.—Situation as Salesman for a Manufacturing or Jobbing Hardware or Cutlery establishment. Have had over twelve years' experience in the business, with an extensive acquaintance in Missouri and Kansas, but would not object to travel elsewhere. Can produce best of references. Address, **R. E. H.,**
Care of Letter Carrier No. 64, St. Louis, Mo.

To Manufacturers of Hardware, Cutlery or Files.—Manufacturers wanting a representative for the sale of their goods in New York, can hear of one by addressing **W. J.,**
Office of **The Iron Age,** 10 Warren St., N. Y.

JOBBING HARDWARE TRADE.—A gentleman of experience in purchasing Hardware, would like to make arrangements with some out-of-town house, to act as their agent. Address, **S.,**
Office of **The Iron Age,** 10 Warren St., N. Y.

SPECIAL NOTICE.

I have three patents for Dies, Machinery, and Tools for making Augers and Bits, each running seventeen years; dated as follows: Dec. 19, 1865; January 31, 1866, and July 3, 1866. There is a special claim on each of the Dies. All persons infringing on said patents will be held responsible to the extent of the law. **Russell Jennings,**
DEER RIVER, Conn., Sept. 7, 1874.

DISCOUNT LISTS.

Iron Screws, Revised List, 15 Discount, 25¢ each. Files & Bolts, 1 Bolt, Revised and Old Lists, 41¢ each. Address, with order, **(Copyrighted),**
Dayton & Lamberson, 97 Chambers St., N. Y.

Charcoal Blast Furnaces.

Having during the past 10 years constructed and put in operation a number of the most successful Charcoal Blast Furnaces in the country, and having a competent corps of workmen constantly in my employ, I am enabled to offer advantages in constructing or remodeling upon the latest and most approved plans.

Examinations of Furnace Property made and reported upon when solicited. Correspondence promptly attended to.

J. M. WHITE, Engineer,
22 W. Alexander St., Rochester, N. Y.

Merchant Iron or Nails

Wanted in exchange for 300 tons No. 1 Wrought Scrap Iron.

GILCHRIST & GRIFFITH,
Mount Pleasant, Iowa.

A. PURVES & SON,

Corner South & Penn Streets, Phila.
Desires in
Scrap Iron & Metals, Machinery, Tools,
Shafting & Pulleys, Steam Engines,
Pumps & Boilers, Copper, Brass,
Tin, Rabbit Metals, Foundry
Facings. Best Quality Ingot Brass.
Cash paid for all kinds of Metals and Tools.

Special Notices.

**THE SIXTH
Cincinnati
Industrial
Exposition**

Opens for the reception of goods August 2, 1875. Opens to the public September 8th, and continues open until October 9th.

16 DEPARTMENTS,
and an extended premium list in medals and gold coin.

**Machinery Tested and Fully
Reported upon.**

Send for rules and premium list, and blank applications for space.

FRANK MILLWARD, Sec'y.

**TENTH
Industrial
Exhibition**

UNDER THE AUSPICES OF THE

**Mechanics' Institute,
OF SAN FRANCISCO.**

Manufacturers, Mechanics, and others, are advised that the above Exhibition will be opened in San Francisco on the

17th day of August

next, and will continue open at least one month. The Board of Managers invite all who desire to exhibit, to send in their application for space without delay to **MR. J. H. CULVER, Secretary,**
27 Post St., San Francisco, who will promptly answer all inquiries.

700,000 PERSONS

from all parts of the Pacific visited the Exhibition of 1874, to see what could be learned or purchased in San Francisco and the United States.

San Francisco, with its population of one quarter of one million, is in intimate relations with Japan, China, Australia, Mexico, Hawaiian Islands, British Columbia, the various islands of the Pacific and contiguous domestic territory.

There is no charge of exhibiting, and power for driving machinery, etc., is furnished free.

By order of the Board of Managers.

A. S. HALLIDIE, Pres't.

Briesen's Patent Agency
FOR SECURING INVENTIONS, TRADE MARKS, &c., IN AMERICA AND EUROPE.
No. 258 Broadway, New York.
A. V. BRIESEN.

SITUATION WANTED by a man who has had 25 years' experience as Manager and Founder of both Anthracite and Charcoal Furnaces. Can give good reference, and willing to work for a salary as the times afford. Address, **K. M. S.,**
Office of **The Iron Age,** 10 Warren St., N. Y.

Wanted.

A situation as Blast Furnace Manager, by a young man who thoroughly understands the practical management of Blast Furnaces, and has had several years' experience in smelting Titanic, Hematite and various other ores. The best reference can be given to influential gentlemen in the iron trade in England. Address, **R. T. F.,**
Office of **The Iron Age,** 10 Warren St., N. Y.

**TO LET,
A Light, Handsome Office.**

Possession Immediately.

HERMANN BOKER & CO.,

101 Duane Street, N. Y.

REMOVAL.

We have Removed our office and stock of Cutlery to

107 Duane St.

PETERS BROTHERS.

DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings

in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors,

101 & 103 Duane St., N. Y.

THE McHaffie Direct Steel Castings Co.

STEEL CASTINGS,
Solid and Homogeneous, guaranteed to stand a Tensile Strain of 25 tons per square inch. An invaluable substitute for expensive WROUGHT IRON FORGINGS or for Iron Castings, where great strength is required. Office, corner of Vellum and Leavitt Sts., PHILADELPHIA.

Send for Circular and Price List.

Wanted.

By an experienced man, a situation to superintend the Practical Department of a Rolling Mill. One who understands the getting up of fine grained iron, and all kinds of puddled iron for all purposes; also, Bessemer steel. Has had large experience in managing works in England. Is a practical iron worker. Refers to Mr. W. Gill, Managing Director Teeside Iron Works, Middlesboro', England; Mr. W. H. Brown, Blackhouse, Upper Thorpe, Sheffield, England. Address, **RICHARD JONES,**
Care FOXELL & JONES, Troy, N. Y.

MANUFACTURERS

desirous of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 99 Cannon Street, London, E. C.

SCALE: First 3 lines, 3/; every additional line, 10d. Price, 6d. per Copy, or 30/ per annum, inclusive of postage to the United States.

Special Notices.

**TO LET,
For Hardware Business,**
Part of STORE, DESK or OFFICE ROOM.

EDWARD PHELAN,
113 Chambers and 95 Reade Sts., N. Y.

WANTED.—A situation to travel for a Manufacturer or General Hardware House, by a young man well acquainted with the New England trade. Commission or salary. Best of reference given. Address, **CHAS.,**
19 Oliver St., Boston.

For Sale.

For Sale or Trade for Iowa or Nebraska Farm Lands.

A fine brick store, 40x80, with a fine well selected stock of Staple Hardware, Stoves, &c., of about \$8,000 to \$10,000. Situated on a principal street, in a flourishing Missouri river and railroad town in Nebraska. Address **E. T. DUKE & CO.,**
Plattsmouth, Neb.

LOWE & THOMASSON,
Chattanooga, Tenn., Dealers in

MINERAL LANDS.
Surveys Made and Titles Investigated. Parties desiring information or wishing to purchase ore or coal lands within the States of Tennessee, Alabama or Georgia, are respectfully requested to communicate.

We have For Sale Very Cheap

Two of the

Finest Charcoal Properties

in America. Brown Hematite Ore, 56 per cent. Metallic Iron, and less than 1-80th of 1 per cent. of Phosphorus. Car Wheel Iron can be made for \$16 per ton. Also 6400 Acres Bituminous Coal Lands, for which part payment will be taken in Northern Pacific R. R. Bonds.

Notice to Capitalists.

FOR SALE.

Coal stock that pays 40 per cent., together with Dry Goods, Groceries, Clothing and a general Mining and Country Store. Also Railroad contract for ten years to supply coal; and a valuable trade with the surrounding country. From 100 to 200 miners are supplied by the company's store. Capital required, \$25,000. For particulars, address, **BOX 5,**
Office of **THE IRON AGE,** 10 Warren St., N. Y.

Rolling Mill and Bridge Building Machinery For Sale.

Bolt Cutters, Milling Machines, Punches, Shears, &c., used in Bridge Building, Machinery for Corrugating Iron, Painting Machine, &c. Corlies Steam Engine, vertical, 33 inches by five feet stroke, fly-wheel 35 feet diameter, weighing 32 tons.

Train 16-inch Rolls—built by Totten, of Pittsburgh—for Rounds, Squares and Flat Iron, all sizes, and Gas Pipe Iron from 2 to 8 inches wide; Lathes for turning Rolls, and every variety of Machinery used in a Rolling Mill.

Catalogue sent upon application to

WM. E. COFFIN & CO.,

Boston, Mass.

FINER CHANCE SELDOM OFFERS.

For Sale, the stock and fixtures of a Retail Hardware House, business successfully conducted since 1860. Located in a thriving town of 10,000 inhabitants. Stock embraces Builders' Hardware, Agricultural Tools and Machines, Stoves and Tinware. Tin Shop in connection. The senior partner having deceased, the surviving partner will sell the entire interest to engage in other pursuits.

Address, **BOWERS & JENKS,**
Milford, Mass.,
May 31, 1875.

The Eureka Agricultural Works, Trenton, N. J., For Sale or Rent.

The subscriber offers for sale or rent for a term of years the manufactory known as "THE EUREKA AGRICULTURAL WORKS," fronting 307 feet on Allen street. Main building about 60x100 feet, containing Wood-working Room, Machine and Blacksmith Shop; also all needed Wood-working Machinery; Lathes, Drill Presses, Boring Machines, Bolt Cutters, Trip Hammer, Steel Presses, Furnaces, Shears and Forges; full sets of Dies for Steel Presses; Polishing Frames, with large number of Emery Wheels; full sets of Blacksmith Tools; a good Foundry in connection with the same, about 40 feet square, with a large number of Flasks, and all the appurtenances. There are also five full sets Pelton Lever Horse Power Patterns—different sizes. Also a good set of Railway Horse Power Patterns of the most approved kind. Also full sets of Patterns for an excellent Thresher and Threshing Machine. Also full sets of Patterns for the Phil Wheel Gang Plow and Cultivator, which has a ready and extended sale. A good Engine and Boilers, excellent Shafting and Belting, in good working order. A Brass Moulder's Furnace in connection with the Foundry.

A large Barn and Wagon House, with about 300 feet of excellent sheds for storage. There is also connected with the Works a good brick Office on Perry street, with five ton Fairbanks' Platform Scales.

A spur of Bel. De. R. R. Co. runs down the rear of the premises, from which supplies of all kinds can be unloaded direct.

Apply to **A. I. BREARLEY,**
Cor. State and Greene Streets.

FOR SALE.

Hardware Business in a Large Western City.

A good run of custom in retail and small jobbing.

An excellent opportunity to make money with small investment of capital.

Particulars will be furnished by addressing **R. S.,**
Office of **The Iron Age,** 10 Warren St., N. Y.

For Sale, Hardware Business

In successful operation since 1846. Rare opportunity to secure an old and established business. Stock of General Hardware, Iron, Stoves, &c., will invoice \$6000 to \$8000. Two story brick business room, 25x30, with cellar under all, for \$2000. After five years' payment will make such terms as will be easy, and cannot fail to suit purchaser. Will assist purchaser at starting, if necessary. Satisfactory reasons for selling will be given.

Address, **U. RAYMOND,**
Cambridge City, Wayne Co., Ind.

For Sale, &c.

Iron Ore & Mineral Lands,

Thirty thousand acres, abounding in the several varieties of Hematite and Magnetic ores, covered with timber; limestone abundant; contiguous to one of the largest Railroads leading east and west, low freights insured; coal within 30 miles of Works. Consists of Charcoal Furnace and Forge of 900 tons a month capacity; fine manager's house, large store, stables and workmen's houses, &c. Labor 75¢ a day; cost of Charcoal, 5¢ a bushel; iron ore, \$1.75 a ton; limestone, 80¢, all delivered at Furnace. Freight to Pittsburgh, \$3-50, Baltimore, \$2-40. Ores can be placed in Pittsburgh almost beyond competition. For sale, or will be operated jointly.

Address, **P. O. Box 863, Baltimore, Md.**

For Sale!

Hardware Business

In a growing manufacturing town, one of the best locations in Vermont. Business well established and profitable. Stock about \$10,000, in good order. This affords an excellent opportunity for a party with small capital to secure a paying business.

Address, **W. R. BIXBY & SON,**
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For Sale.

A clean and complete stock of Hardware, Tin and Stoves, with the good will of an old and well established trade. Room centrally located and well used for same business for 25 years past, and in one of the most substantial and rapidly growing cities of Northern Ohio. Do a business of about \$75,000 per year, and will invoice about \$30,000. Will sell Hardware separate if desired. Good and satisfactory reasons given for selling. Apply to, or address,

MYERS & WILLIAMS, Tiffin, Ohio.

For Sale.

A first-class Hardware Business, located in the thriving city of Bloomington, Ills. Above business has been established for over twenty (20) years, and presents to any one desirous of doing an "A No. 1" retail and jobbing trade a most favorable opportunity. Amount of stock about \$15,000. Will be sold at a sacrifice. Ample reasons given for selling. For further information, address,

GEO. BRADNER, Bloomington, Ills.

To Charcoal Iron Manufacturers.

\$25,000 (one-half cash, balance in one year) will buy a half interest in a first-class Eastern Charcoal Furnace, now in successful operation. To a practical iron manufacturer, who can superintend the operation at the Furnace, this offers a rare chance.

Address, **CHARCOAL FURNACE,**

Office of **The Iron Age,** No. 10 Warren St., N. Y.

STEAM PUMPS FOR SALE.

1 Pair (Gould & Garrison) Vacuum Pumps, 16 inch air and 10 inch lift steam cylinders.

1 Steam Pump (Gould & Garrison), 12 inch water and 24 inch steam cylinders.

The above has been used six months, and will be sold very cheap.

J. R. JOHNSON,

Richmond Steam Forge, Richmond, Va.

FOR SALE.

An 1/4 inch mill train for making Merchant, Band and iron. Will be sold cheap.

Apply to **W. W. JONES,**

Near the Lehigh Valley Railroad Depot,

Allentown, Pa.

To Stove Manufacturers and Foundrymen.

The Carbon Stove Company,
of Burlington, N. J.,

Will sell their Foundry, with all its appurtenances, business and good will, upon very liberal and accommodating terms, offering to any party wishing to engage in the Stove or general Foundry Business a rare opportunity.

The Foundry Buildings, which are of a capacity to employ forty or more molders, are very conveniently located upon navigable tide water on one side, and the Pennsylvania Railroad, with its freight station in front, being on the direct line between New York and Philadelphia.

The Buildings, Machinery and Appliances are all in prime order, and the assortment of Patterns, &c., for Stove, Range or Heater work, unsurpassed.

Address, for terms or other particulars,

CARBON STOVE CO., Burlington, N. J.

FOR SALE.

At Lowest Manufacturers' Rates.

GUNS & SHEET ZINC,

Best German and Belgian Brands,

By **LOUIS WINDMULLER & ROELKER,**

20 Reade Street, N. Y.

For Sale,

Stove and Tin Business.

Will sell, on good terms, one of the best arranged House Furnishing Stores in Canada West

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, June 2, 1875.

The past week has been one of great and continued excitement in Wall street, especially in the stock market. Until Saturday the market continued to decline very rapidly, led by Erie and the stocks of the other roads now engaged in cutting each other's throats in the matter of rates. Monday no business was transacted, but on Tuesday an immense business was reported, over 500,000 shares of stock changing hands. In the money market the extreme case continues. Borrowers on call are accommodated at 2 3/4 per cent., and prime mercantile paper is discounted at 4 5/8 per cent., with 3 1/2 per cent. as the exceptional rate for choice names. The gold market has been strong and steadily advancing. The following table shows the extreme daily range of the premium:

	Highest.	Lowest.
Thursday.....	116 1/2	116
Friday.....	116 1/2	116
Saturday.....	116 1/2	116 1/2
Monday.....	—	—
Tuesday.....	116 1/2	116 1/2
Wednesday.....	116 1/2	116 1/2

The Treasury will sell coin to the amount of \$500,000 on each Thursday of June.

The market for government bonds is strong, both here and in Europe. A new call for five millions more of 5-20s was issued on Tuesday—interest on the bonds called to cease on the 1st of September. Railway mortgages are active and strong. We give below the closing quotations for governments.

In the stock market, the course of which has been already outlined, the principal dealings have been in Erie, Western Union, Lake Shore, Union Pacific, Northwestern, Pacific Mail and Ohio & Mississippi. We give below the highest and lowest of to-day's quotations of active shares.

The bank statement shows a gain in total reserve of \$3,197,900, and in surplus reserve of \$3,007,600, the banks now holding \$16,631,775 lawful money above the legal requirement. The following is a comparison of the averages for the past two weeks:

	May 22.	May 29.	Differences.
Loans.....	\$233,600,800	\$281,396,500	Dec. \$248,300
Specie.....	10,634,600	11,482,600	Inc. 848,000
Leg. tend.....	61,022,000	63,371,900	Inc. 2,349,900
Deposits.....	232,129,700	232,890,900	Inc. 761,200
Circulation.....	20,163,100	19,921,100	Dec. 242,000

The imports and specie exports for the week are given as follows:

	1873.	1874.	1875.
Total for week.....	\$6,515,921	\$8,580,605	\$9,357,343
Prev. reported.....	179,748,608	170,126,285	142,579,941
Since Jan. 1.....	\$186,264,579	\$178,706,890	\$151,537,284

Among the imports of general merchandise were articles valued as follows:

	Quant.	Value.
Amvils.....	310	\$1,939
Brass goods.....	12	964
Bismuth.....	1	888
Bronzes.....	6	1,778
Chains and anchors.....	43	2,306
Copper.....	4,633	26,477
Cutlery.....	9	1,044
Gas fixtures.....	37	4,572
Guns.....	36	1,577
Hardware.....	18	15,328
Iron, pig, tons.....	1,116	3,567
Iron, sheet, tons.....	377	19,043
Iron, cotton ties.....	7	7,595
Iron, other, tons.....	489	23,390
Lead, pigs.....	4	697
Lead, tons.....	14	1,298
Old metal.....	5	12,056
Platina.....	7	1,430
Per caps.....	9	2,536
Saddlery.....	3,442	22,498
Steel.....	6	769
Silverware.....	19,652	144,948
Tin, boxes.....	597	5,830
Wire.....	14,396	1,036
Zinc.....		

	Total for the week.....	Bid.	Asked.
Previously reported.....	\$1,598,112	129 1/2	130 1/2
Same time in 1874.....	\$28,474,344	129 1/2	130 1/2
Same time in 1873.....	\$1,992,817	129 1/2	130 1/2

Government bonds at the close were strong. We quote:

	Highest.	Lowest.
U. S. Cen. & Hudson Consolidated.....	102	102 1/2
Lake Shore.....	102 1/2	102 1/2
Rock Island.....	102 1/2	102 1/2
New Jersey Central.....	102 1/2	102 1/2
Delaware, Lackawanna & Western.....	102 1/2	102 1/2
Michigan Central.....	102 1/2	102 1/2
Cleveland & Pittsburgh.....	102 1/2	102 1/2
Illinois Central.....	102 1/2	102 1/2
Yabash.....	102 1/2	102 1/2
Western Union Telegraph.....	102 1/2	102 1/2
Atlantic and Pacific Telegraph.....	102 1/2	102 1/2
Northwestern.....	102 1/2	102 1/2
Pacific Mail.....	102 1/2	102 1/2
Erie.....	102 1/2	102 1/2
Ohio & Mississippi.....	102 1/2	102 1/2
Union Pacific.....	102 1/2	102 1/2
Kansas Pacific.....	102 1/2	102 1/2
Missouri Pacific.....	102 1/2	102 1/2
Atlantic & Pacific Preferred.....	102 1/2	102 1/2
C. & C. Ind. Con.....	102 1/2	102 1/2
Hannibal and St. Joseph.....	102 1/2	102 1/2
Quicksilver Pref.....	102 1/2	102 1/2
Am. Mer. Union Express.....	102 1/2	102 1/2

The following were the highest and lowest prices of stocks to-day:

	Highest.	Lowest.
U. S. Cen. & Hudson Consolidated.....	102	102 1/2
Lake Shore.....	102 1/2	102 1/2
Rock Island.....	102 1/2	102 1/2
New Jersey Central.....	102 1/2	102 1/2
Delaware, Lackawanna & Western.....	102 1/2	102 1/2
Michigan Central.....	102 1/2	102 1/2
Cleveland & Pittsburgh.....	102 1/2	102 1/2
Illinois Central.....	102 1/2	102 1/2
Yabash.....	102 1/2	102 1/2
Western Union Telegraph.....	102 1/2	102 1/2
Atlantic and Pacific Telegraph.....	102 1/2	102 1/2
Northwestern.....	102 1/2	102 1/2
Pacific Mail.....	102 1/2	102 1/2
Erie.....	102 1/2	102 1/2
Ohio & Mississippi.....	102 1/2	102 1/2
Union Pacific.....	102 1/2	102 1/2
Kansas Pacific.....	102 1/2	102 1/2
Missouri Pacific.....	102 1/2	102 1/2
Atlantic & Pacific Preferred.....	102 1/2	102 1/2
C. & C. Ind. Con.....	102 1/2	102 1/2
Hannibal and St. Joseph.....	102 1/2	102 1/2
Quicksilver Pref.....	102 1/2	102 1/2
Am. Mer. Union Express.....	102 1/2	102 1/2

GENERAL HARDWARE.

The only circulars of any importance to the Hardware trade issued since we last went to press, are the circulars of the manufacturers of Strap and T Hinges, the chief features of which were given in our last week's issue.

The market for nearly every description of Hardware may be safely reported very dull, and there are no changes in values to report. The same remarks will apply to Foreign Hardware. The demand for Nails continues light, and prices remain as previously quoted, viz.: 10d., in lots of 200 kegs and over, \$3.25, net. Small lots, \$3.35 to \$3.40.

In House Furnishing Goods there is a fair business doing in seasonable goods. The combination prices for Stamped and Retinned Ware remains as before.

Romer & Co., Newark, N. J., have issued a revised catalogue and price list for their Brass and Iron Patent Pad Locks, Railroad Car Locks, and Mineral and Porcelain Door Knobs, &c. This book is very fully and clearly illustrated, and will be sent to the trade on application.

The following amusing correspondence will explain itself:

St. Louis, May 5, 1875.
Globe Nail Co., Boston, Mass.: As you request to have all imperfect Nails of your make returned to you, in order to replace them by perfect ones, I have sent to your address per mail two imperfect Nails found among other Nails of your make, with the hope that you will send me good ones for them, as I am too poor to lose that amount. This collection I have made within the last four years, the time I have used your Nails, and of about four or five tons consumed during that time. I truly hope you will improve your machinery, so that in future such loss may be avoided, and the country will be much benefited thereby.

Very respectfully, yours,
(Signed) P. H. O'NEILL.

OFFICE OF GLOBE NAIL COMPANY,
BOSTON, May 10, 1875.

P. H. O'Neill, St. Louis, Mo.—Dear Sir: Yours of 5th at hand, and contents noted. We are disposed to do what we can to protect our customers in the use of Globe Nails, and we are very glad you have returned the two imperfect ones. You do not state how long you have had these laid by, but to allow interest in the capital invested, we have sent you four Nails, and trust they will prove in every way satisfactory. We are constantly at work trying to improve our machinery, and hope to arrive at perfection some day. And we remain,
Very respectfully, yours,
GLOBE NAIL CO.

William E. Coffin & Co., Boston, Mass., advertise, on the opposite page, Rolling Mill and Bridge Building Machinery for sale. We invite the attention of our readers to this advertisement.

BRITISH IRON MARKET.

(Specially reported by cable for The Iron Age.)

WEDNESDAY, June 2, 1875.

Scotch Pig.—The market is very unsettled, and makers' prices are difficult to quote. The following are as near as they can be given under the present state of the market:

Gartsherrie No. 1.....	66 1/2
Coltness No. 1.....	68 1/2
Glenarnock No. 1.....	69 1/2
Eglington No. 1.....	67 1/2

Manufactured Iron and Rails are without change.

There is great uneasiness in the trade, owing to gigantic failures.

IRON.

American Pig.—The market is in a condition difficult to describe. The old and strong Lehigh companies stand out pretty firmly for the extreme prices of \$28 and \$30 for No. 1 and No. 2 Foundry, and \$24 to \$25 for Forge. The weaker and less favorably known companies (as also those on the North River) evince a greater disposition to sell, and shade prices according to circumstances. On the whole, there seems to be a tendency toward lower prices. It is reported that a leading dealer in Pig and Scrap is in financial difficulties. Transactions continue limited to the current needs of consumers, without large sales. We continue our quotations, viz.: Foundry No. 1, \$27 @ \$28; Foundry No. 2, \$25 @ \$26; Gray Forge, \$23 @ \$25.

Scotch Pig.—This market is, if anything, duller than ever, and the advices from the other side (see our cable report) are by no means encouraging. We quote Eglington, \$30; Coltness, \$31; Glenarnock, \$32 @ \$33; Gartsherrie, \$31 @ \$33.

Rails.—We hear of the sale of 2000 tons of English 56 lb. Rails, in bond, to go to Canada, at \$38, gold. In American the market is without change. We quote \$48 @ \$50, currency, at works.

Old Rails.—We note no change in the situation, and continue our quotation of \$26 @ \$28.

Scrap.—We quote \$33 @ \$35, without any important sales.

METALS.

Copper.—Transactions for the week have embraced 200,000 pounds Lake on the spot, in lots, at 22 1/2 c. At 22 1/2 c. more can, in all likelihood, be had. This, so far as small parcels are concerned; larger lines would probably not be obtainable below 23 c. @ 23 1/2 c. The principal holders are as firm as ever, and look forward with confidence to the time when the active demand for manufacturing purposes shall manifest itself; they consider themselves in a strong position, and hold out for extreme rates. Baltimore we nominally quote 22 1/2 c., with nothing done during the week. On Friday last Chili Bars stood \$28. No later telegrams are to hand from London since, but we have the mail accounts to the 23d ultimo. The West Coast charters for two successive fortnights have been heavy, viz.: 2300 tons the latter part of April and 2100 tons the first half of May, and thus prevented an improvement, which the favorable statistical position of May 1 would otherwise have brought about. Upon reading the various English and Continental metal reports, to hand by late mails, it strikes us that Copper, Lead, Antimony and Spelter, all consumed on a more or less extensive scale

for purposes of ornament, are for this very reason in a good position in Europe, since every one of the governments over there steadily remains in the market as a purchaser. Only thus can we explain the satisfactory deliveries, and without this war demand prices would be considerably lower, since trade and industry administering to the ordinary requirements of the people of Europe are as flat and unremunerative as can be. The great failures in London have not, therefore, the bearing on these four metals, we venture to assert, which they would have if their position depended at this juncture on commerce alone. And this steady underhand call for Copper for cartridges places our own Lake Copper in an exceptionally favorable light. Manufactured is steady at 30c. for new Sheathing, 31c. for Copper Bolts and Braziers' Copper, 21c. for Bronze and Yellow Metal Sheathing, and 28c. for Yellow Metal Bolts.

Tin.—The Dutch auction went at 50 guilders, which was a couple of guilders below the figure the speculators for a rise at London had hoped for to sustain the advance they had managed to produce, and Straits instantly receded £2, and has since declined another 10/, now being cabled £82.10/. Yesterday the following private dispatch was received from London: "Business generally very dull, and there is an uneasy feeling in trade circles. Straits Tin, £82.10/. We think Tin prices will keep steady, as shipments from the Straits for the United Kingdom for May are only 250 tons, while deliveries have been large, say 3000 tons, including Holland." Mail advices from the same party, dated May 20, indicated that if shipments from the Straits to England continued light, values would probably be sustained. Imports of Tin into England for the first four months of 1875 had been 138,019 cwt., against 54,793 and 55,648 in 1874 and 1873. The extraordinary excess was mainly due to the large Straits shipments, hence a somewhat prolonged falling off in the latter would have a decided influence. Business in the metal here is quite stagnant, sales being limited to supplying the immediate wants of consumption, which are not of a pressing nature. We nominally quote Straits, English Common and Refined, indiscriminately, 12c., gold, with shadings as to quantity, and Banca, 22c. @ 23 1/2 c., gold. Tin Plates are also in a bad way and weak, the only sale of note come to our notice being 1000 boxes Coke Tin at \$6.75 c., gold, per box, the remaining dealings being merely of a jobbing nature. We quote, gold, per box: Charcoal Bright, \$8.50 @ \$8.75; ditto Terne, \$7.62 1/2 @ \$7.87 1/2; Coke Tin, \$7, and ditto Terne, \$6.75, all gold. England's export of Tin Plates to this country during the first four months of 1875 was 36,750 tons, against 33,490 and 36,871 in 1874 and 1873. The great decline in England seems to arise wholly from over production.

Lead.—Sales have not exceeded 100 tons Domestic at 5.90 c. @ 5.95 c., gold. We have now entered a couple of dull months, yet the chief holders are firm, and store their Lead rather than part with it below these figures. They expect the demand for the fall trade to open with vigor early in August, or even a little sooner, and leave the smaller receivers to supply what straggling demand there may be in the meantime. Foreign nominally commands 6 1/2 c., gold. A sale of about 100 tons is reported on terms not transpired. European accounts up to May 23 exhibit a slight slackening in the demand. Yet for reasons we have given in another portion of our report, the position on the other side seems, in the main, a strong and healthy one. The manufacturers of Lead have remained supported as follows: Bar, 8 1/2 c.; Pipe, 9 1/2 c.; and Sheet, 9 1/2 c., less 10 per cent.

Spelter and Zinc.—Holders of Domestic still demand 7.15 c. @ 7 1/2 c., currency, but consumers do not readily subscribe to this figure, and in order to move any greater quantity, a lower price would have to be submitted to. Sales for the week have been restricted to trifling lots within the above quotation, 30 days. Silesian Spelter remains firm in Europe, but there is no demand for it here. We nominally quote 7 1/2 c. @ 7 3/4 c., gold, without any quotation transpiring therein afloat. The market is bare. The quietness in Sheet Zinc continues, and we do not alter our quotation of 8 1/2 c. @ 9 c., gold.

Antimony.—Has been hardening, in sympathy with the constantly enhanced cost in Europe, and is now strong at 13c., gold, after some larger dealings had taken place between 12 1/2 c. and 12 3/4 c., gold. On the 21st instant London stood £38, against £48 a year ago.

COAL.

The Coal market still continues without any material change. Business remains inactive, and the market is fully supplied with Coal, notwithstanding the large decrease in the supply of Anthracite of over two millions of tons.

At a meeting of the New York Lehigh Coal Exchange, held May 30, the following resolution was adopted: "Resolved, That inasmuch as the suspension of work still continues at the mines in the Lehigh region, it is considered inexpedient to make prices for Lehigh Coal for the month of June."

The quantity of Coal sent from the Schuylkill region the last week was 24,740 tons by rail; by canal, 2085 tons; for the week 26,831 tons, against 117,448 for the corresponding week last year.

The supply sent from all the regions so far this year foots up 4,416,416 tons, against 7,496,093 tons to same period last year. Decrease, 2,080,677 tons. The decrease in Anthracite is 2,034,140 tons, and there is also some decrease in Bituminous Coal compared with last year.

We quote as follows: Anthracite, \$4.75 @ \$5.70; Cumberland, \$6.50 @ \$7; West Virginia, \$6.25 @ \$7; James River Steam, \$6.25; James

River Carbonite, \$9 @ \$9.50; Kanawha House, \$14.25; American Gas, \$7 @ \$7.25; American Cannel, \$12 @ \$14; Pennsylvania and Westmoreland, \$9.75; Murphy Run, \$6.50; Newburg Orrel, \$6.50; Sterling Ohio, \$10; Ince Hall, \$17 @ \$18; Liverpool House Cannel, \$17; Liverpool Gas, \$12; Newcastle Gas, \$7; Scotch, \$7.50 @ \$8.

The Coal transported over the Cumberland Branch Railroad during the week ending May 29, 1875, amounted to 6788 tons, as against 5299 tons shipped in the corresponding period of last year, showing an increase of 1489 tons. Over the Cumberland and Pennsylvania Railroad, for the same period, the shipments were 57,415 tons, against 54,863 tons shipped in 1874, an increase of 2552 tons. The aggregate amount of Cumberland Coal shipped by the various companies so far this year amounts to 768,295 tons.

OLD METALS, PAPER STOCK, &c.

The market for Paper Stock and Rags has somewhat improved since last week. White Rags, No. 1 and 2, and Canvas Cotton, and Linen Canvas, are moving freely, and are firm at quoted rates. Colored Rags are in little request, and prices have a drooping tendency. The demand for Hemp and Grass Rope is very light, and quotations remain nominally unchanged. Old Metals are dull and declining. We quote the following as the current purchasing rates:

Old Metals.—Copper, 16c. @ 17c. per lb.; Yellow Metal, 11c. @ 12c.; Composition, heavy, 13c. @ 14c.; Lead, solid, 5 1/2 c.; Tea Lead, 4 1/2 c.; Zinc, 4 1/2 c. @ 4 3/4 c.; Pewter, No. 1, 18c.; do. No. 2, 8c. @ 12c.; Spelter, 5c. @ 5 1/2 c.; Wrought Iron, 1 1/2 c.; Sheet do., 1 1/2 c.; Cast, do., 1 1/2 c.; Machinery, do., 1 1/2 c.; Rags, &c.—Canvas, Linen, 5c. @ 5 1/2 c.; do. Cotton, No. 1, 6c. @ 6 1/2 c.; No. 2, 2 1/2 c.; White, No. 1, 6 1/2 c.; No. 2, 4 1/2 c.; Colored, do., 2c. @ 2 1/2 c.; Mixed, Woolen, 2c. @ 3c.; Soft, do., 5c. @ 5 1/2 c.; Gunny Bagging, 1 1/2 c.; Jute Butte, 1 1/2 c. @ 2c.; Kentucky Bagging, 3c.; Book Stock, 3c.; Waste Paper and Scraps, 1 1/2 c.; Kentucky Bale Rope, 4c.; Oakum J. & K. No. 1, 4 1/2 c. @ 5c.; do. No. 2, 3c.; Tarred Shaking, 1c. @ 1 1/2 c.; Grass Rope, 2 1/2 c. @ 3c.

IMPORTATIONS.

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending June 1, 1875:

Hardware.
Arnold & Co. Bundles, 202
Mose, pkgs., 2 Rods, coils, 1089
Blumenthal I. & A. Phelps, Dodge & Co. Taggers, 370
Mose, pkgs., 3 Wilson & Asmus, Scrap, tons, 21
Baker Hermann & Co. Order.
Mose, pkgs., 30 Bars, 155
Casks, 2 Pig, tons, 900
Brinknerhoff V. W. Scrap, rails, tons, 20
Guns, ca., 10
Binns L. B. & Co. Cases, 3
Friedman & Lutterjung, Mds, pkgs., 3
Field A. & Co. Cases, 6
Cases, 15
Cutlery, ca., 2
Fleischmann, Sichel & Co. Cases, 3
Folsom H. & D. Guns, ca., 11
Fuller Bros. Cases, 1
Harris E. S. Guns, ca., 2
Hildick A. H. Cases, 2
Jones Chas., 1
Cases, 2
Keuffel & Esser, Mds, pkgs., 1
Laugland & Co. Wire, pkgs., 9
Moore J. P. Sons, Mds, pkgs., 1
Rosenfeld Bros. Cases, 2
Russell & Erwin Mfg. Co. Files, cks., 2
Spies, Klemm & Co. Mds, pkgs., 4
Sawyer John, Wire rope, coils, 5
Tomes Francis & Co. Guns, ca., 1
Tillotson L. G. & Co. Wire, wire, lots, 400
Turner R. A. Cutlery, cks., 2
Cases, 3
Van Wart & McCoy, Mds, pkgs., 1
Wright C. L. & Co. Wire, coils, 1
Wiebisch & Hilger Mfg. Co. Mds, pkgs., 630
Order.
Files, cks., 31

Naylor & Co. Bundles, 202
Rod, coils, 1089
Phelps, Dodge & Co. Taggers, 370
Wilson & Asmus, Scrap, tons, 21
Order.
Bars, 155
Pig, tons, 900
Scrap, rails, tons, 20

Steel.
Barton, Alexander & Walker, Wire, cks., 4
Brown Wm. Mds, pkgs., 233
Crab Wm. & Co. Wire, bbls., 66
Jacobs, Strouse & Co. Strips, cks., 6
Naylor & Co. Cases, 49
Bars, 28
Tires, 22
Artes, 10
Piersons & Co. Bessemer rods, bbls., 294; rods, ca., 3
Prosser Thos. & Sons, Tin plates, bxs., 685
Gosler & Co. Tin plates, bxs., 100
Woodford W. O. Cases, 4
Weed & Becker Mfg. Co. Bundles, 86
Order.
Bundles, 935
Cases, 4

Metals.
Agostine J. Scrap copper, bxs., 1
Bruce & Cook, Tin plates, bxs., 685
Cort N. L. & Co. Tin plates, bxs., 100
Gosler & Co. Tin, bxs., 100
Jackson R. D. Bar tin, bbls., 10
Jova, Terry & Co. Scrap, copper, bxs., 4
Montell & Son, Scrap, cks., 1
Scrap, bxs., 1
Morrell J. Copper, pcs., 5
Copper, cks., 3
Brad, cks., 3
Naylor & Co. Tin plates, bxs., 355
Orell J. Tin plates, ca., 8
Phelps, Dodge & Co. Tin plates, bxs., 3042
Tin taggers, bxs., 370
Black taggers, ca., 120
Wilson & Asmus, Scrap, metals, bbls., 4
Scrap, zinc, bxs., 1
Order.
Lead, pigs, 5146
Lead, bars, 5
Terne plates, bxs., 4
Terne plates, ca., 45
Tin, bxs., 950

PHILADELPHIA.

PHILADELPHIA, June 1, 1875.
There is no especial change to note in the situation of the Iron market here since our last. A moderate degree of activity exists, more so probably in Pig Iron than in other grades, but a fairly active market in almost all. The supplies of coal are increasing, and it is considered that the general strike is practically over, although but comparatively few collieries have resumed as yet. With a general shipment of coal to factories and furnaces, we may look for a more active trade, but no material advance in prices for the summer months. The increased activity west of Pittsburgh has been in some measure reflected upon this market, and, in addition to more demand for Manufactured Irons, and especially Rails, there are very considerable orders for Pipe Irons here now from that section. The Railroad Iron trade is much better than generally supposed, many transactions occurring which never get in print. The Steel Rail mills are well supplied with orders, most of which Western Bessemer works having orders which

will keep them busy for the remainder of the year. Bars are in only tolerable demand, and Nails very dull of sale at low figures. Old Rails are without change to note; but Scrap is very scarce, and a good article of No. 1 Wrought is much wanted. We continue last week's quotations, which are without change, viz.: Pig Iron—No. 1 Foundry, \$27 to \$28; No. 2, \$26; Gray Forge, \$24 to \$25.

Bars.—2c. to 2 1/2 c. per lb.
RAILS.—\$50 to \$53, at works.
OLD RAILS.—\$28 to \$29.
SCRAP.—\$32 to \$33.

The sales include the following, viz.:

took nearly thirteen hours to work six heats. Instead of from ten and a-half to eleven hours. After a careful inquiry into the facts bearing upon the matter, the stipendiary held that the men were wrong, and ordered each to pay £3 and the costs incurred.

The Board of Trade returns for the month of April show that there has been a falling off in the aggregate exportation of coal, coke and patent fuel. The quantity shipped from Grimsby, all of which would doubtless be sent from the South Yorkshire and Derbyshire districts, was as under: To France, 5085 tons; Germany, 1985 tons; Holland, 373 tons; Belgium, 366 tons; Sweden, 210 tons; Norway, 306 tons; Denmark, 171 tons; Russia, 1236 tons; Egypt, 7946 tons; West Indies, 617 tons; South America, 77 tons; Nova Scotia, 265 tons; and coastwise, 1659 tons, making a total of 23,856, as against 20,943 tons in April, 1874.

In the cutlery trades more business was done last week than usual, prior to the cessation of work to which I have already alluded, many of the leading firms being enabled by an improvement in their order books, to find a very respectable complement of work for the men. I do not, nevertheless, hear that the American market is yielding any materially increased number of orders for common cutlery, but I am informed that some of the manufacturers of razors, best table cutlery and special knives are doing what they deem to be a satisfactory amount of business with the States. Canada and British North America generally are, on the contrary, sending us very encouraging orders, and our transactions with that portion of her majesty's dominions are on a scale which is of an especially peculiar nature. Australia, too, and the West Indies, are buying special cutlery, and ordinary goods of that ilk, very freely from us. From the Cape of Good Hope merchants are believed to have recently received advices which have induced them to buy cautiously, but with tolerable freedom, for immediate shipments. The dispute between Joseph Rodgers & Sons and their spring knife cutlery continues, but the firm are not thought to be much inconvenienced.

BIRMINGHAM AND STAFFORDSHIRE.

Again it is my lot to record "that there has been no material alteration in the iron trade of the above localities during the past week." The demand continues languid, and prices are wholly unaltered, so that it appears to be next to impossible for any new feature of interest to be laid hold of. Personally, and writing as not being directly or vitally interested in the results which might ensue from what I am about to suggest, I feel bound to express a vehement desire that the leading men in some branch of trade or other should get up some wild form of excitement in order to relieve the existing dreadfully monotonous level. It is bad enough for those who are directly affected by the dullness of trade, but it is a double torture to the unfortunate man who is required to note the unvarying aspect of the desert week by week. "Of such am I," but I must not murmur, for the time doubtless will come when a change will have to be recorded. It is, even now, to be borne in mind that a few specifications of decent size have just been placed for best bars and sheets for Russia, Australia and British India. The United States are buying no iron from South Staffordshire other than tin plates and hoops. Unmarked iron is, if anything, weaker on late transactions, bars having changed hands at £8.5/10 to £8.10/0 per ton. In the hardware branches prices are firm, save a reduction of about 1/2d. in the price of electroplated goods. Locks and bolts are in great request, but prices have a downward tendency in South Wales.

THE SOUTH WALES DISTRICT.

has already been alluded to, but I may say, in amplification of what I have stated in a former paragraph, that at Cyfarthfa Mr. Crawshaw has started the refineries, and will have several mills at work in a few days. The Blaenavon works are already in active operation. Mr. Fothergill has a mill at work at his Plymouth establishment, and will have others in a few or ten days. At Pateux, near Newport, new steel works are being erected. Tin plates are in better request, but prices have a downward tendency in South Wales.

THE METAL MARKETS.

have been quiet during the week just ended, and sales have been rather slowly effected. Prices, in the main, have been characterized by a consistent steadiness, except spelter, which has risen on the strength of large transactions. Messrs. French & Smith's report says: "Trade is still inactive. Iron continues steady. The break up of the strike in South Wales will give more life to this trade. Copper steady. Tin steady, with a good demand for consumption and export. Tin plates dull. Lead—The smelters are well employed; prices remain stationary. Spanish pig, both with and without silver, is about £22.5/0. In other metals no change.

Messrs. Von Dadelzen & North state that "Chili bars declined from £82.10/0 to £81.10/0 without any apparent cause, but closed rather better. £81.10/0. G. O. B. Named brands have realized 20/0 to 30/0 extra. Australian altered. Wallaroo sold at £90.10/0. f. o. b., and Burra sold for £89.10/0 in warehouse. English steady, some sales of India sheets reported at £93.10/0 to £94.10/0. A moderate business reported at steady prices. The major portion is, however, simply exchange business (forward purchases against cash sales). Straits has ruled from £88 to £89.10/0 on the spot, and £89.10/0 forward delivery. Australian, £88.10/0 to £89.10/0. English steady at £90.10/0. In Holland, Banca quoted at 50 1/2, and Billiton, 47 1/2. Tin Plates—A moderate demand, at late rates. Lead is quiet, but unchanged; £23 for good soft English pig. Spelter—Considerable purchases of foreign have been made during the week, at higher prices, but particulars do not transpire. We quote Silesian £24 to £24.5/0, for ordinary brands, both here and at outports; special, £24.10/0 to £25. English is now held for £25.10/0, delivered, and sales have been made thereat. Quicksilver steady, at £12.

Messrs. Harrington, Horan & Co's Liverpool report runs thus: "On the 3d instant telegrams from Valparaiso advised charters for the second fortnight in April as 2100 tons fine copper, consisting of 1900 tons bars and ingots, and 200 tons in ore and regulus. After tonnage £23 good ordinary brands, gradually declined in value to £21.10/0 per ton. There is a good consumptive and export demand for English, and smelters are all asking full rates for manufactured and other sorts of copper. This strengthens the hands of importers, who are sanguine that eventually an advance in value must be established. During the past fortnight 895 tons bars on the spot sold at £23 to £23.10/0, per ton, and 555 tons, to arrive, or with extra prompt, at the same prices. The quantity of Chili copper float and chartered for to date is 11,220 tons fine. Stock of Chili copper in Havre, 1st inst., 1920 tons. Stock of foreign copper in London, 1st inst., 9023 tons. Tin—Market steadier at £82 for Straits, £81 for Australian, £80 for British, and £78 for Peruvian, as in quality. At the Dutch sale on the 30th inst. about 700 tons Banca will be offered. Lead—Market steady at £23 for ordinary shipping brands. Spelter—Market firm at £24.10/0, per ton for ordinary Silesian brands.

Messrs. James & Shakespeare say that in Tin considerable improvement has taken place in the demand for English, and smelters have,

consequently, been able to dispose of a good quantity of ingot at 90/0, at which they now decline to make further sales, while, on the other hand, buyers do not seem willing to pay any advance upon that figure. The large deliveries of foreign during the past month, which were published on the 30th ult., had the effect of inducing some rather heavy purchases for a rise, and on Tuesday last the values of Straits and Australian had advanced to 84/0 and 82 1/2/0 respectively, since which, however, the market has again become dull, and closed yesterday at a reduction of about 1/2 per cent. from the highest point. It should not be forgotten that during the past two years the smelters obtained large supplies in the shape of Australian ore (the imports of which have now almost entirely ceased), and by adding the said quantities to the deliveries of metal, it will be found that the consumption of the present year is not so greatly in excess as would appear to be the case if the figures for tin alone were used for the purpose of comparison.

The Mining Journal remarks: Copper—Throughout the week the copper market has been quiet, and, although there is no change of importance to note in quotation, the tendency is toward slightly easier prices. Lead—The market continues firm, and prices unaltered. Soft English pig is quoted £22, and soft Spanish without silver, £23.5/0. Soft Spanish with silver, has been done to day at £22.10/0. Spelter—Silesian is not obtainable under £24 at outports. English is firm, as likewise is hard. Zinc—Foreign sheet zinc is now held for £28.5/0. Quicksilver—There is no change to report in this metal, the last quotation being £12 per flask. Tin—There has been very little variation in this metal throughout the week, and up to toward the close there has been very little doing, but within the last day or two the foreign tin market has exhibited a slight improvement in demand. To day the quotation for Straits is very uniform, at £82, and Australian £81, cash. Tin Plates—The market is quiet, and makers are compelled to submit to a concession in price in order to secure contracts.

Latest Liverpool prices are these:

Iron: f. o. b. in Liverpool, per ton.	£	s.	d.	£	s.	d.
Merchant bar, in Wales.....	8	10	0	8	15	0
Merchant bar, in Wales.....	8	0	0	8	5	0
Staffordshire.....	9	0	0	11	15	0
Hoop.....	10	10	0	11	10	0
Sheet.....	12	5	0	13	0	0
Nail rod.....	9	5	0	9	15	0
Bar, best crown.....	9	0	0	9	5	0
Boiler plates.....	11	5	0	12	0	0

Tin Plates: f. o. b. in Liverpool, per box.	£	s.	d.	£	s.	d.
Charcoal, L.C.....	1	14	0	1	17	0
Coke, L.C.....	1	5	0	1	8	0

Copper: Delivered in Liverpool, per ton.	£	s.	d.	£	s.	d.
Bolt and Sheathing.....	25	0	0	25	0	0
Tin.....	88	0	0	88	0	0
Tough cake.....	90	0	0	90	0	0
Best selected.....	92	0	0	92	0	0

Scientific and Technical Notes.

In a paper by Mr. W. G. Larkins, before the Society for the Promotion of Scientific Industry, in

ART REPRODUCTION IN CAST IRON.

the speaker said that in the Exhibition of 1851 the Royal Prussian Iron Foundry exhibited a number of small groups of cups and vases in cast iron, some of which were very artistically decorated by means of gilding and silver let-in in the fashion of niello. A similar small display was made in 1863, with a further development in the form of jewelry. Mr. Alfred Taylor, the reporter on the class, treated the castings with contempt, and instead of seeing a new means of producing works of art, he spoke of them as curiosities, calling them "very remarkable," but adding: "We believe the energy of these establishments is gradually being turned to the production of more important works than delicate objects of taste, for which the material itself is not well adapted." That very utilitarian view it was charitable to put down to a want of knowledge of the method of production of those castings, for no one would be so bold as to deliberately give an opinion that the worth of a work of art was limited to the worth of the material used. In the year 1867, "Enquiry" called attention to those castings, but nothing further was heard upon the matter till the display at the Vienna Exhibition, two years ago, once more gave an opportunity of drawing attention to the adaptability of iron to art purposes of the most delicate kind. It was with the view of promoting that he drew their attention to the subject that night. To those who were only accustomed to the casting of iron in large masses in the manner usually followed, such an idea might, perhaps, seem still to be impracticable. They knew that a casting, fresh from the mould, had a very irregular surface, and that it had either to be scraped and polished by hand, or put through a planing machine until it had the requisite smoothness. Now, it would be readily seen that any such scraping or planing or even polishing of the casting of a work of art would utterly destroy its value, and its excellence would fade with every application of the tool. But when he told them that the specimens on the table were practically as they left the mold, and when they saw the faithful reproduction of the marks of the tool of the master-hand that executed them, they would agree at once that every objection on the score of the inadaptability of the metal for the purpose had been successfully surmounted. The only other objection that anyone not knowing the subject would make to the castings would be as to their appearance; still, he thought, it would be admitted that they did not compare unfavorably with the bronze. The castings shown at the Vienna Exhibition were similar to those shown on the table. They were chiefly reproductions of objects of the Roman period of the middle ages and of the Renaissance. Many of them were copies of well-known works, and some of them were of special design suitable for the purpose. In giving the reproductive arts their just due, he might be allowed to point out that while educating the public taste, they also afforded to art-workmen an opportunity of studying the great creations of their fellow-craftsmen of the past. The scrupulous exactness with which the old masters executed their work, an exactness that did not admit of neglect even in the smallest and least important detail, caused great difficulties in the reproduction of such

works—difficulties which were especially great in iron castings, on account of the impossibility of the parts being united together by soldering. But, notwithstanding those disadvantages, the problem has been solved, and that in such a manner that iron castings might be substituted for electrolytic productions, combining as they did greater strength with equal fineness, while, being cheaper, they might certainly be preferred. Those were results which had been achieved through continued exertions, with the view of cultivating pure art in the production of iron castings, and it was very desirable that those exertions should be continued by future iron foundries. Mr. Larkins then gave a short history of the Isenbun Iron Works, from which he had obtained a number of splendid castings, and spoke at length of the difficulties which had been overcome in certain foundries in producing an artificial molding sand suitable for casting. He regretted that he was not able to inform the meeting as to the subjects of many of the castings he had produced, but he directed especial attention to certain friezes, which were admirably adapted to the decoration of furniture. The price of the works was, he said, in general terms about one-sixth that of similar articles in bronze. Looking at all those facts, he hoped they might help to introduce into Great Britain a hitherto unrecognized source of production of some of the best specimens of art metal work.

The British Admiralty, acting upon the recommendation of the Boiler Committee, have entered upon a contract with the Yorkshire Engine Company for

NEW STEAM MACHINERY

for the Pelican, to be made on the principle patented by Mr. Perkins. The contractors undertake to maintain full power during the ordinary six hours' trial on coal consumption of 1 1/2 lbs. per horse-power per hour. Every portion of the machinery has peculiarities quite novel to marine engineers. The steam pressure is to be 250 lbs. on the square inch. The patentee claims to attain greater economy, complete immunity from explosions, because of the enormous strength of the tubes forming the boilers; great durability of internal parts, great evaporative power, the boiler being composed of tubes which are always clean, because nothing but distilled fresh water is used, and the same water is used over and over again, and a saving in weight of about 20 per cent. A naval engineer, Mr. McIntyre, has been appointed by the Admiralty to attend at the works in Sheffield for the inspection of the machinery during construction. The ship is now building at Davenport. This Mr. Perkins, we understand, is a descendant of Mr. Jacob Perkins, the inventor of the steam gun and many other ingenious contrivances, an American, who went to England many years ago. The consumption of fuel guaranteed is very small, and few engines have exceeded this economy. It will be noted that the boiler pressure is enormous, being considerably greater than that used on locomotive engines, and three times greater than that generally used in marine work. Seventy pounds is about as large as steamers, with compound engines and new boilers, ever employ, though a few have used 80.

The following is a description of a new ARTIFICIAL LIGHT FOR PHOTOGRAPHING, which has been recently invented in France. A quart bottle, with a somewhat large mouth, has a cork with two openings. Through one of these a tube passes to near the bottom of the bottle; through the second a larger tube, packed with iron-scale, issues. Fragments of pumice fill the bottle, and on these carbon disulphide is poured. A current of nitric oxide prepared by Deville's method—by the action of nitric and sulphuric acids on metallic iron contained in a self-regulating reservoir—is passed through the bottle, where it takes up the vapor of the disulphide. It is then led through the safety-tube packed with iron-scale to the burner. Excellent photographs were taken in five seconds with this light, the object being six feet distant. In photographic power the light is asserted to be superior to the magnesium or calcium light, and even to surpass the electric light itself. The products of combustion are noxious and must be got rid of.

A proposal has been recently made to employ the residents of high altitudes in

BALLOON ASCENTS.

In a paper just read before the Paris Academy of Sciences, by M. Tissandier, the survivor of the Zenith, it is stated that the maximum-barometers, which had been sealed up and afterwards opened in the laboratory of the Sorbonne, showed that a height of 8600 meters was reached by the balloon. Calmarca, in Bolivia, is situated at a height of 4100 meters, Potosi 4000 meters, and some villages in Thibet are as high as 5000 meters. It is at once apparent what an immense advantage an aeronaut nurtured in these regions would have over those accustomed to the barometric pressure of the sea level, the maximum height reached by the Zenith not exceeding his accustomed altitude by more than 75 per cent. This proposal is worthy of serious consideration, and may lead to the scientific training of those who are now unaware of the interest attaching to regions easily accessible by them. We may mention here that M. de Fourville, in a letter to *Nature*, attributes the fatal consequences of the Zenith expedition to the rapidity of the ascent, but mainly to the gas which escaped from the balloon. He expresses his intention of soon making another ascent with M. Daruof and a *Times* correspondent, and M. Tissandier is also about to make a new trial, the object of these gentlemen being to complete the former experiment, which was rendered defective by the breaking of the carbonic acid tubes.

It seems that we are yet to have the famous BLUE COLOR of the ancients, for it appears that M. Peligot, a French chemist, claims to have discovered

the lost art of producing the beautiful shade of blue which is so conspicuous in many of the ancient ornaments found in Egypt. He analysed some of the enamel, then by synthetical experiments has succeeded in ascertaining the proportions of silica, oxide of copper, lime and soda that will produce the marvelous compound.

EXPLOSIVE BULLETS.

are coming into general use in that waged against the larger animals, so much so that they must tend very much to hasten the extinction, certain in any case, of those whose spoils are useful or whose presence may be dangerous to man. There is a species of whale which is caught off the Norwegian coast which is larger although not so productive as the Greenland or "right" whale. This immense mammal is pursued in steam vessels, and captured by a Mr. Foyn, of Vadsø, in North Sweden, by means of an ingenious harpoon, which is described by the British Consul at Christiania as possessing two movable barbs, which, when it has been fired into the whale, and the line hauled upon, expand and become fixed at an angle of 45° on each side, effectually precluding the possibility of the harpoon being withdrawn. At the same time a capsule, contained in the harpoon, explodes, usually causing instant death to the animal, which is then towed to the factory of Mr. Foyn, the blubber removed, and the rest of the carcass converted into artificial guano.

F. W. Oliver is producing on iron designs of various colors.

IMITATING VITREOUS ENAMEL.

This effect is produced in the following manner: A crystalline appearance is given to tinned iron by means of a mixture of water and sulphuric and nitric acids, applied thereon, and afterward washed off. An impression of a design is made on suitable transfer paper, on which coatings of solid white and silver bronze dust and colors are applied. The plate, prepared as above, is coated with a mixture of turpentine and copal varnish; it is then heated, and the design transferred thereon in the usual way, and the plate is baked and polished.

An Improved Outlook for the West.

The Chicago Tribune says: Our manufacturers are gradually but surely reviving, and afford very hopeful evidence of returning prosperity. Among them none suffered more severely, during and for some time after the panic of 1873, than the iron interest. Nearly all the railways in process of construction then were stopped, and hence iron masters here and elsewhere were sadly embarrassed, and many of them were forced into liquidation. It was the last to show any symptoms of life, but there are now unmistakable signs that the worst is over. The capitalists who are building the immense iron mills and furnaces on the Calumet in South Chicago would not invest their hundreds of thousands of dollars there did they not feel well assured they can do a large and profitable business. Owing to the low price of steel rails, our old and substantial railway companies, such as the Rock Island, Chicago & Alton, Illinois Central, Michigan Central, and also the Union and Central Pacific, have all given large orders for steel rails, to be delivered during the current year. Well informed parties report the aggregate of these orders at 75,000 tons. Most of these contracts were taken by the Joliet, North Chicago and Union Rolling Mill companies, and they are sufficient to keep their respective steel departments fully occupied during the year. With the exception of a few miles of double track in process of construction by the Chicago and Alton Co., all these are to replace the old worn-out iron rails, and a gentleman, whose opinion is worthy to be well considered, assures us that if the Grangers will only keep quiet till these main lines have their tracks laid with steel rails they will get lower freights. The adverse legislation in Wisconsin, it is understood, will prevent the Northwestern from laying any steel rails in that State.

There is more demand for iron rails to build new lines. Mr. Hinckley is building the Chicago, Clinton and Western, from Clinton, Ia., to Iowa City, and also the road from Rochelle to Rockford. This will give the people of that city another outlet to Chicago via the Chicago and Iowa, and the Chicago, Burlington and Quincy allways. Governor Merrill, of Iowa, is in the city arranging to purchase rails for the line from Albia to Knoxville, almost thirty miles of which is being built in the interest of the Chicago, Burlington & Quincy.

The Eastern steel and iron mills, we learn, are not running on full time, and whatever real activity there is the Western mills exhibit. Steel rails are now sold some 40 per cent. less than they were in 1873, and at present prices are 25 per cent. less than the cost of the foreign article.

The Failures in England.

On Thursday telegraphic advices were received from England announcing the failure of the Aberdare Iron Company. The dispatch read as follows:

LONDON, June 1—5.30 A. M.—The Aberdare Iron Company has failed, with liabilities to the amount of £750,000. Their nominal assets are estimated at £280,000. This sum is the total valuation of their works, together with those of the Plymouth Iron Company, which is one concern with the Aberdare Company.

This failure involves Sanderson & Co., bill brokers, and Gilead A. Smith. Their liabilities are placed at £600,000, for the greater part of which their creditors hold securities. James Daburn is also involved. The latter's liabilities are estimated at £24,000, and assets at £25,000.

The Times comments on the failure of the

iron companies and Sanderson & Co., as follows:

We regret very much to record a double failure, which will probably produce results similar to those which followed the collapse of Overend, Gurney & Co. It is said that the Sandersons are involved with the iron companies to the extent of £800,000; and that the aggregate liabilities will amount to several millions sterling.

Yesterday the announcement was confirmed by telegram from Mr. Smith, agent of the Aberdare Iron Company, in this city, now in England. Upon personal inquiry, we learn that Mr. Smith's liabilities have been very much exaggerated, and that his failure will have practically no disturbing effect upon the American market. The weakness of the Aberdare Company has been known so long that its effect has been discounted abroad, and the effects are not likely to be far-reaching or serious. The company have extensive iron mills in Wales, capable of producing immense quantities of railroad iron, but various causes combined reduced their operations for two years past very materially. The collapse of new railroad enterprises in this country after the panic, a series of obstinate strikes, the great advance in ores, coal and labor in England, seriously embarrassed the company, and at last forced them to suspend.

Big Blast.—The Berkshire Courier says that the new furnace of Barnum Richardson Company, at East Canaan, Ct., which was blown out about one week since, performed one of the greatest feats that has ever been made by any charcoal furnace in the United States, by the production of 803 1/2 tons of car wheel iron at a single blast continuing 104 weeks. Although there has been considerable blast puffing and blowing done by the iron manufacturers of the Atlantic slope for the past few years, this record stands without a parallel. The next best production to this was made by the Lanesboro Iron Company, at Lanesboro, Mass., a few months since, when 594 tons were made in a blast which continued for 89 weeks. As regards the quality of the iron produced, some of it has stood a test of 35,000 pounds to the square inch, while 25,000 pounds to the square inch is considered as a remarkably strong test. To render the achievement more perfect, perhaps it will be well to add that the ore used in this remarkable blast was obtained from the Salisbury mines, whose reputation stands second to none in the world. Much credit is due to J. S. Corbit, the founder.

The Allentown Chronicle says: It may not be generally known that charcoal blast furnaces in this and Carbon counties, where a few remain, as a rule only stay in blast during seven or eight months in a year, being generally run by farmers who, during the summer months, devote themselves to their lands. The blast for these charcoal furnaces is usually produced by water-power, the furnaces being located near a stream, and only prepared ore is placed on the stack; for which reason there is not a large quantity of cinder compared with what an anthracite furnace produces, and the quality of the cinder is very different, being glassy and turned various ways reflects from the smooth parts of its surface very many beautiful colors. One man can dispose of all the cinder that comes from a charcoal furnace by wheeling it away in a barrow, and in this process of manufacturing the furnace is tapped every few hours. As a matter of information, already familiar to many of our readers, the above will doubtless be new to a portion, as it was to the writer, and interesting.

Brown, Bonnell & Co., Youngstown, Ohio, employ, when in full running order, 600 men at their mills and furnaces. Many more are employed indirectly by contractors.

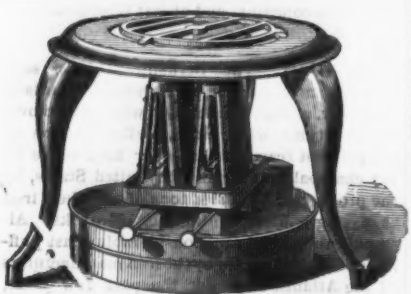
London Metal Market.

(From The Mining Journal.)

Terns tin melting South Africa.						
Copper—	£	s.	d.	£	s.	d.
Best Selected.....	90	0	0	91	0	0
Tough Cake & Tile.....	89	0	0	90	0	0
Sheeting and Sheets.....	93	0	0	94	0	0
Boils.....	85	0	0	86	0	0
Bottoms.....	80	0	0	81	0	0
Old.....	80	0	0	81	0	0
Australian, Wallaroo.....	90	0	0	90	10	0
Other brands.....	88	0	0	89	10	0
Chili bars, G. O. B.....	81	10	0	82	10	0
Wire.....	0	1	0	—	—	—
Tin—per ton.	0	0	0	—	—	—
Sheet.....	0	0	0	94	0	0
Wire.....	0	0	0	95	0	0
Tin—per ton.	0	0	0	—	—	—
Sheet.....	0	0	0	12	0	0
Yellow Metal sheathing.....	0	0	74	0	0	74
Sheet.....	0	0	0	0	0	0
Spelter—per ton.	24	0	0	—	—	—
Foreign on the spot.....	24	0	0	—	—	—
To arrive.....	24	0	0	—	—	—
Zinc—per ton.	29	0	0	—	—	—
In Sheets.....	29	0	0	—	—	—
Quicksilver—per bottle, 1 lb.	41	0	0	—	—	—
Tin—per ton.	90	0	0	91	0	0
English Blocks.....	90	0	0	91	0	0
Ditto Bars (in Bricks).....	91	0	0	92	0	0
Ditto Kenned.....	92	0	0	93	0	0
Banca.....	88	0	0	89	0	0
Straits.....	82	0	0	83	0	0
Australian.....	81	0	0	82	0	0
Tin Plates—per box.	1	18	0	—	—	—
IC Charcoal.....	2	4	0	0	0	0
IX.....	1	16	0	1	17	0
IX.....	2	0	0	2	0	0
IX.....	1	5	6	1	7	6
IX.....	1	16	0	1	15	0
Canada Plates.....	16	0	0	17	0	0
Iron—per ton.	8	10	0	8	12	6
Bars, W. & L. in London.....	8	10	0	8	12	6
To arrive.....	8	10	0	8	12	6
Nail Rods.....	9	0	0	9	15	0
Nail Rods, Staff'd in London.....	9	15	0	10	15	0
Bars.....	10	12	0	11	0	0
Hoops.....	8	10	0	11	0	0
Bars at Works.....	9	10	0	11	0	0
Hoops ditto.....	9	10	0	11	0	0
Sheet, single and plates.....	11	0	0	12	10	0
Fig. No. 1 in Wales.....	5	0	0	6	10	0
Reinforced metal ditto.....	7	0	0	8	0	0
Do, merchant, Type or Tee.....	7	15	0	8	0	0
Ditto, Italian, in Wales.....	6	10	0	7	0	0
Ditto, Swedish, in London.....	16	0	0	17	0	0
To arrive.....	16	0	0	17	0	0
Fig. No. 1 in Clyde.....	8	12	6	4	17	6
Ditto, L. & B. Type or Tee.....	4	0	0	4	5	0
Ditto, No. 3, 4, 5, 6.....	3	10	0	4	0	0
Chairway Chairs.....	4	10	0	4	0	0
Do, single.....	12	10	0	14	0	0
Indian Churn Pigs in L'don	—	—	—	—	—	—
Steel—per ton.	—	—	—	—	—	—
Swedish, in Kepp (rolled).....	19	10	0	20	0	0
Ditto (hammered).....	19	10	0	20	0	0
Ditto, in Ingol.....	19	0	0	24	0	0
English and Swedish.....	19	0	0	24	0	0
Lead—per ton.	22	15	0	23	0	0
English Pig, common.....	23	0	0	—	—	—
Ditto.....	23	0	0	—	—	—
Ditto, WF.....	23	10	0	24	0	0
Ditto, Sheet.....	24	0	0	25	0	0
Ditto, Red Lead.....	24	10	0	25	0	0
Ditto, White.....	30	0	0	31	0	0
Ditto, Patent Sheet.....	22	0	0	22	10	0
Do, single.....	22	0	0	22	10	0
* At the works, i. e. to 10, 60 per ton less. Terns plates						

Magnetic Iron Sand in Vermont.—New and extensive deposits of iron sand have lately been developed near Gaysville, Vt. The sand is very pure and almost wholly free from phosphorus and sulphur, and containing only a trace of titanium. The concentrated sand yields from 68 to 70 per cent. of metallic iron, and in concentration yields fine washed gold to the value of from \$30 to \$40 per ton. The supply of sand is very extensive, and the facilities at hand for its reduction are said to be excellent. Charcoal can be had for 8 to 10 cents per bushel, a large water power is at hand, and railroad communication is established to a point within five miles of the works. We are told that the sand can be concentrated and the gold extracted for \$5 per ton. The iron produced from the sand is valued at from \$70 to \$75 per ton, and is of superior quality for the manufacture of fine cast steel, which is produced by a direct operation. Mr. J. J. Salterry, of Gaysville, is engaged in developing the deposit and concentrating the sand.

Dayton, Ohio, manufacturers are all unusually busy.



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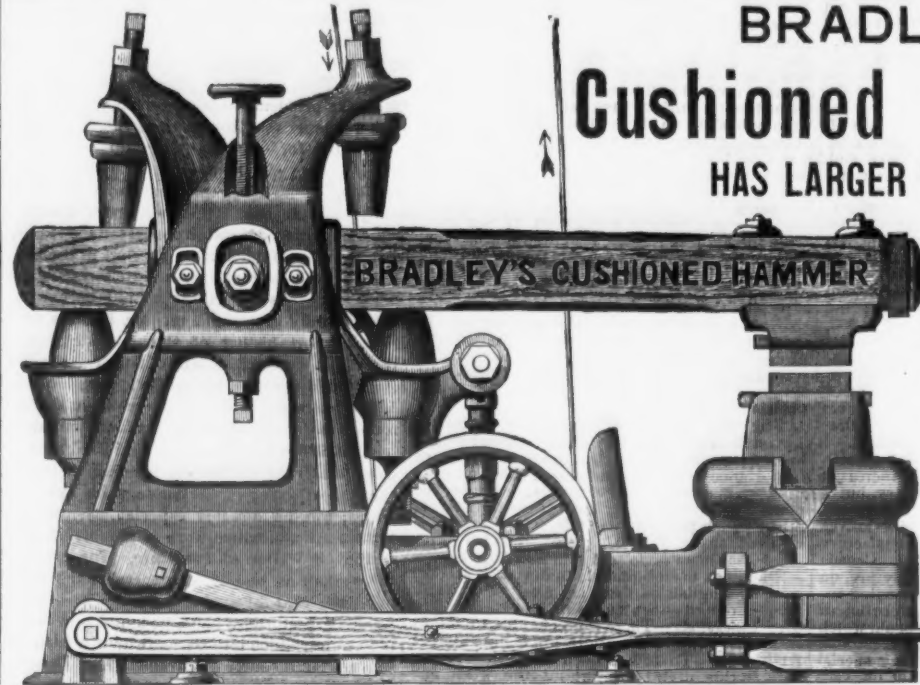
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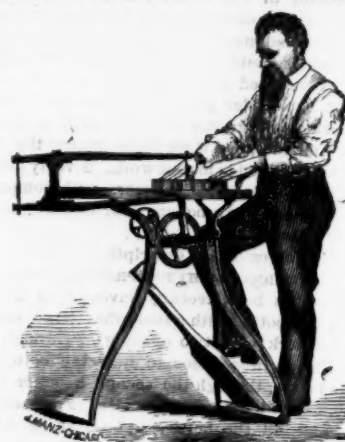
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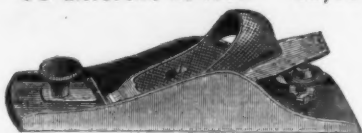
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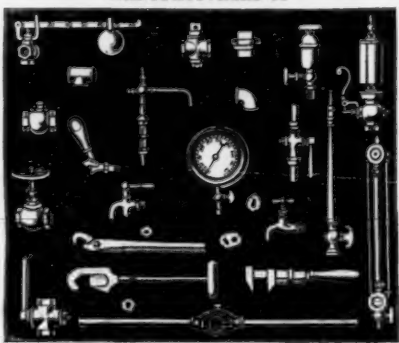
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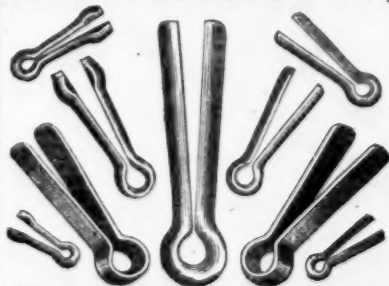
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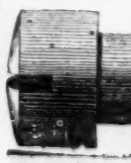
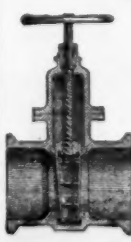
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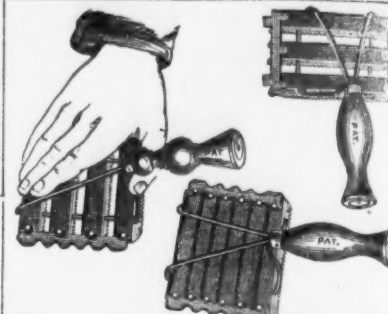
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Forests and Hydraulics.

At a recent meeting of the Farmer's Club, of New York, a paper by Mr. George May Powell, chairman of the Forest Committee, was read as follows: In respect to droughts and freshets, the forest is to the stream what the balance wheel is to the steam engine. In all its interlacings of the interests of agriculture, hydraulics, navigation, climate culture, fuel, building material, &c., this great forest subject presents facts and philosophies, causes and effects without number, which apply to all its phases. Mechanical engineers may tell us that it is becoming a nicely balanced question to determine whether steam-power or water-power is the most economical for driving operative machinery. If, however, we ask them how the case would stand if the streams were as free from excessive droughts and freshets as they were before the deforesting of the hills, their verdict will be emphatic in favor of water-power. The great damage already done to our otherwise boundless hydraulic power is as certainly attributable to injudicious treatment of our forest interest, as its ruin is to result from failure to adopt scientific wood land economies similar to those practiced in the old world. As certain to do so as gravitation is to draw an unsupported body to the earth.

If the commonest kind of common sense would not, as it does, teach this, numberless "stubborn facts" stand to testify it. When we point to the disappearance of springs and large streams, as well as small ones, where the water collecting and keeping arrangement provided by nature has been broken up, some of the numerous order of "Doubting Thomases" ask us to prove that this was the cause of the effect. The make-up of Thomas is such that he is hard to be convinced, because he constitutionally prefers not to see the point; but we can present facts which can hardly fail to be like gravel in the teeth, even for him.

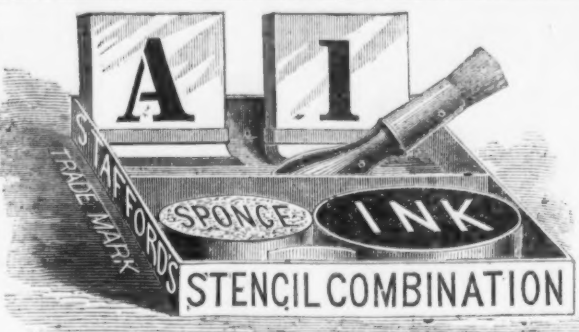
We point him to the New England mountain spring, which President Marsh saw in both conditions: First, lost by cutting off the trees; second, restored by simply letting the bushes grow on a rocky knoll of only a single half-acre in extent, just above it. In the same line of argument we also present the following from M. Clare's Etudes, &c., pages 53 and 54: "Every Parisian may convince himself without venturing beyond the Bois de Boulogne, or the forest of the Meudon. Let him, after a few rainy days, pass along the Chevreuse road, which is bordered on the right by a wood, on the left by cultivated fields. The fall of water and the continuance of rain have been the same on both sides; but the ditch on the side of the forest will remain filled with water proceeding from the infiltration through the wooded soil long after the other contiguous to the open ground has become dry. The ditch on the left will have discharged in a few hours a quantity of water, which the ditch on the right requires several days to receive and carry down the valley.

Boussingault tells us of a large spring in the Island of Ascension which dried up after the wood around it had been cut, and at once reappeared after reforesting it to the immediate vicinity. Marschand gives a similar testimony relative to the fountain of Varleux, which formerly supplied the castle of Pruntrut. He also cites the case of the iron works, Unterwyl, which formerly had an abundance of motive power from the fall of the Sorne, and which was noted for being almost unaffected by either drought or heavy rain when the wood around its head waters was standing, but which became noted for the reverse qualities after deforesting. The introduction of steam was found necessary to prevent stopping the works altogether.

Marschand also tells of the factory of St. Ursanne, a river which from time immemorial had supplied it abundant power, but which had been stopped altogether for want of its motor, after the trees were stripped from its banks. "The influence of the forest on the springs," says Hummel, "is strikingly shown at Helbronn." The woods on the hills surrounding the town are cut in regular succession every twentieth year. As these cuttings approach a certain point, the springs yield less water, some of them none at all; but as the young growth shoots up, they flow more and more freely, and at length bubble up in their original abundance (Page 32, *Physique Geographie*). The Wolfe spring, in the Commune of Soubrey, has twice disappeared, and twice come to life again, from the same causes during the last 90 years. That it is by nature a first-class fountain, is proved by the fact that during over 40 consecutive years of that 90 it was famous as "the best in the clos du Doubs."

When, as a people, we wake up on this subject, we shall hear less of the crash and the shrieks resulting from dams and dykes being overstrained by freshets; fewer reports of hundreds, and of thousands even, of skilled laborers, with whom life is a struggle for bread, being thrown out of employment because the rivers sleep.

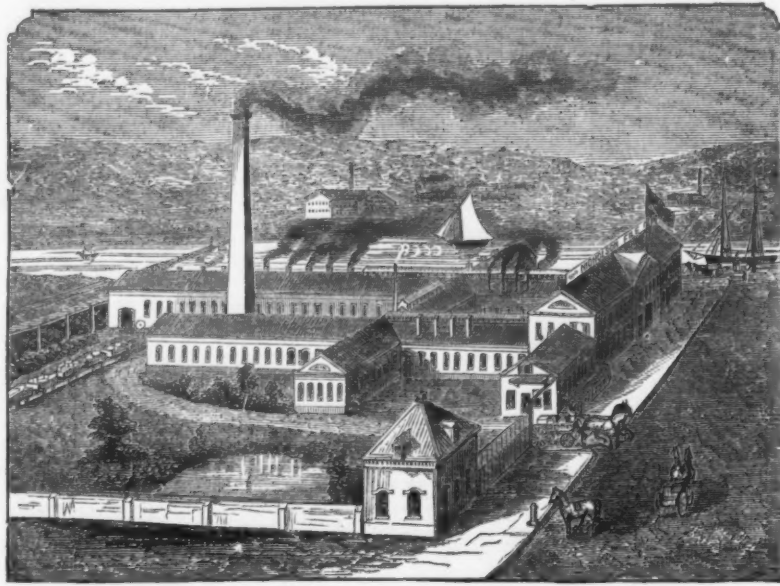
In the north of Wales a spring of wondrous power and purity wells up from the earth. In an edifice which is erected over it are numberless crutches and canes, which have been brought there and left by cripples who superstitiously believe the fountain has healed them. In less than a quarter of a score of miles of its course, as it dances away to the sea, it turns machinery which gives employment to over 3000 skilled toilers. In the latter office, by helping people to help themselves, it is, in fact, many times more than doing what the lame and the halt fancy it has done for them. It has also furnished a type of what the Almighty Father intends the genius of hydraulics to be to His children. Let us care for the forest guard He has given us for its protection.

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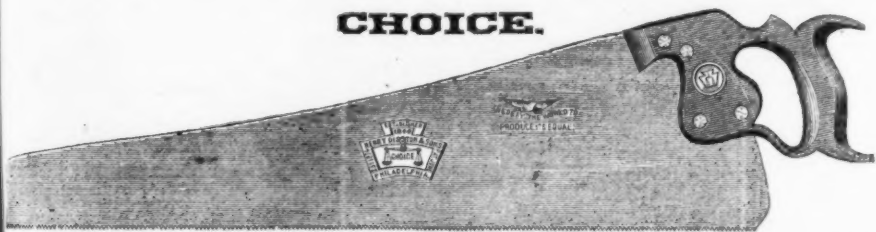
SAWS OF EVERY DESCRIPTION.

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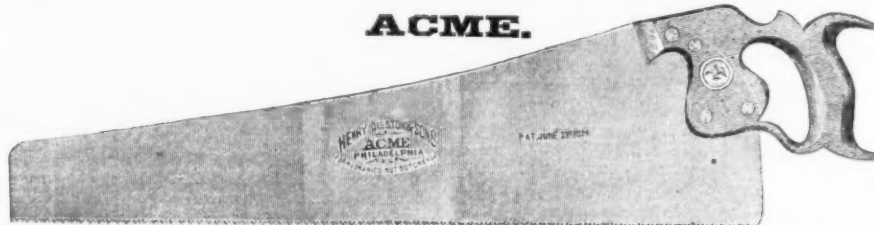


This Saw is the "CHOICE" of all first-class Mechanics who have used it.

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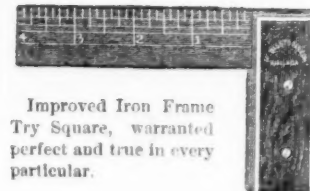
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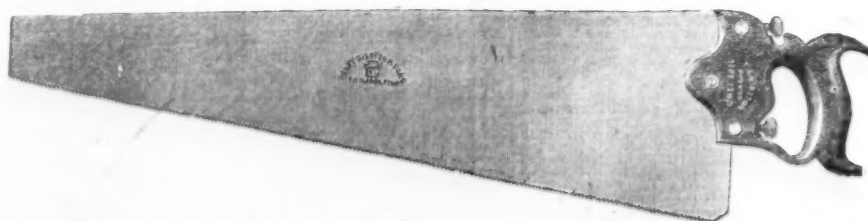


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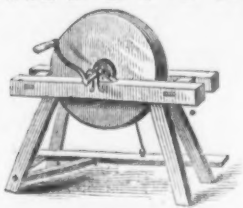
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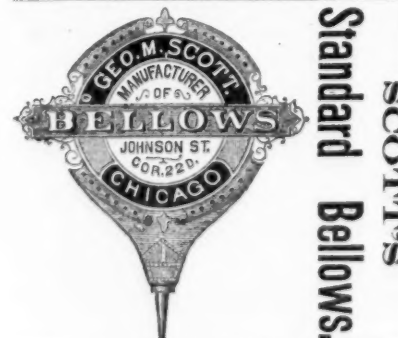
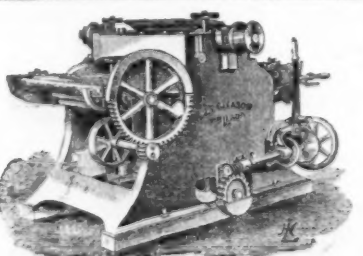
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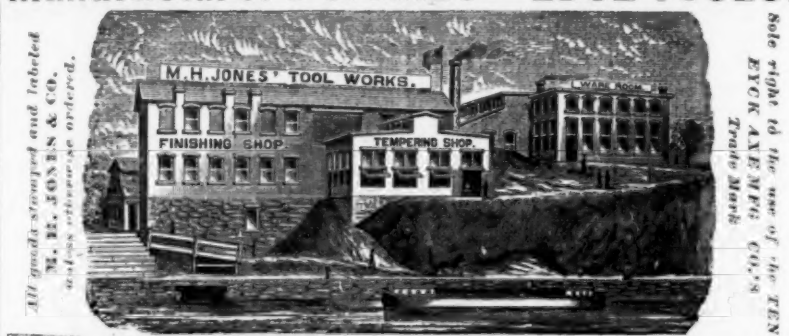
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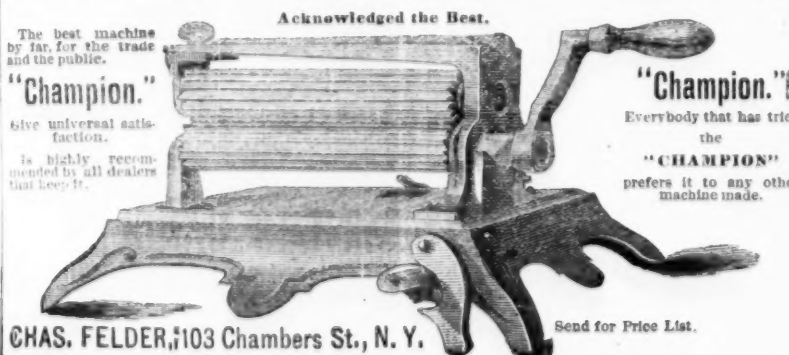
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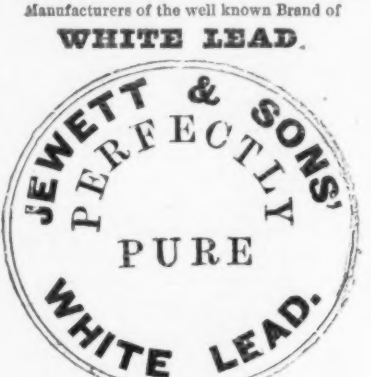
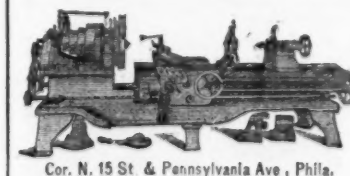
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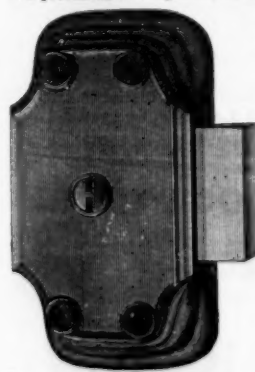
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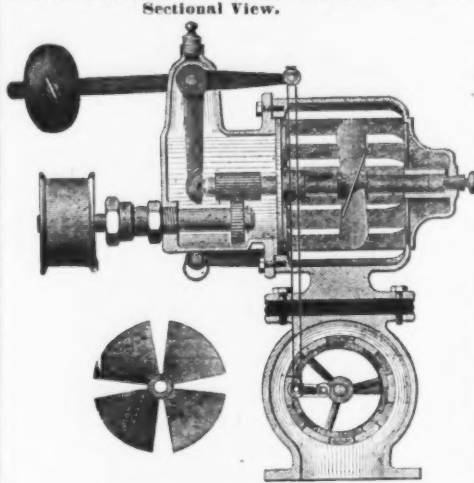
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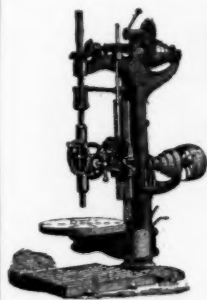
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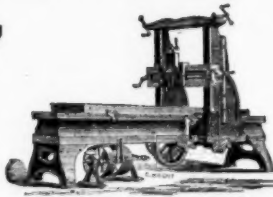
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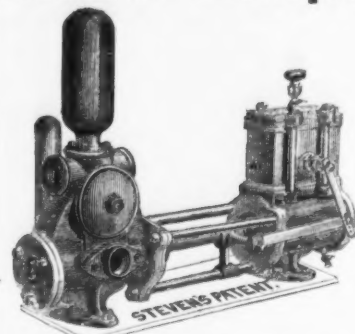
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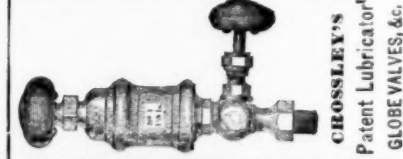
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Bennett Hotchkiss and
N. C. Stiles' Patent.This Drop (which has been illustrated in this jour-
nal of that class in which the Hammer is raised by a stiff
belt or board passing up between two friction rolls, and
is so well known that we will only describe our improve-
ments. The patents we are working under are those of
BENNETT HOTCHKISS (who in an interference case with
Goulding and Cheney was declared the first inventor) and
N. C. STILES. Our improvements consist:First.—Of an arrangement of parts that makes it the
most complete Jobbing Hammer, and will take the place
to a great extent, of all other kinds for forcing. In ad-
dition to the upright rod, which is operated by the ham-
mer to open and close the rolls, we place another rod
the lower end of which is secured to the end of a lever
which is operated by the hand or foot, which operation
also opens and closes the rolls at will. The lower end of
this rod has a slot, so that the action of the hammer will
not disturb the hand lever, thereby preventing the hand
being injured, as otherwise would be the case.Second.—No dog is used on the upright to hold up the
hammer. The belt or board passes up between two
campeers situated under the rolls, so arranged that as the
hammer falls they will freely open of themselves, but
when they are to close and hold up the hammer,
the hammer falls the clamps are opened by pres-
sure upon the foot treadle.Third.—The board or belt is secured to the hammer by
an elastic connection, which prevents the sudden jar and
destruction of the same. The back roll is made adjust-
able to different thicknesses of board or belt, as also are
the clamps. An adjustable collar on the upright rod al-
lows the operator to obtain any height of blow desired
automatically. If one blow is wanted, press upon the
treadle and remove the pressure as soon as the blow is
given. Keep the foot upon the treadle and the blow
will be repeated until the pressure is removed. If a
blow of less height than the collar is set for is required
work the hand lever, which will give you any height of
blow desired. The hammer can be held up at any point
below the collar by bringing the hand lever into action
when the hammer is at the desired height, so that the
next blow can be given from a state of rest, or less height
than the collar is set for. This is a feature no other drop
has; that is, the first blow struck can be of less height
than the second or third, and obtained from a state of
rest. A gentle pressure upon the treadle will allow the
hammer to go down slowly, but it will stop and remain
suspended at any point as soon as the pressure is re-
moved.The clamps in holding up the hammer keep the board
from touching either roll and prevents the same from
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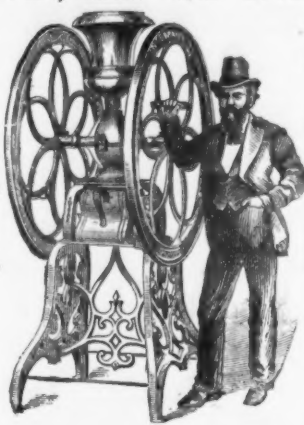
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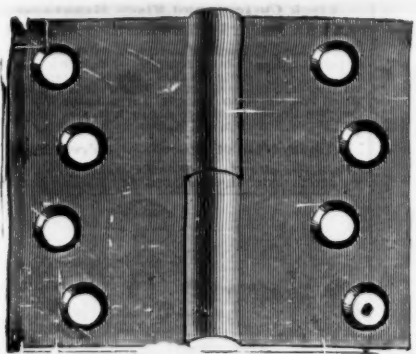
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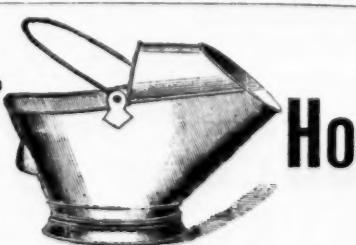
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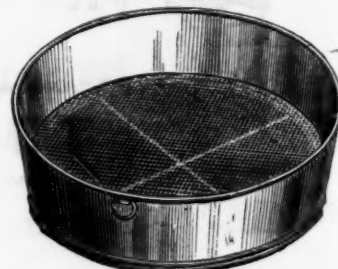
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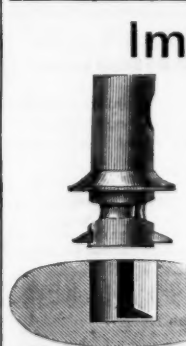
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Boy's Handled Blue Jacks. 12 00

Blue Jacks.—Wadleigh's Oak. \$10 50

Blue Jacks.—A (Extra). B (No. 1). C (No. 2). D (No. 3). E (No. 4). F (No. 5). G (No. 6). H (No. 7). I (No. 8). J (No. 9). K (No. 10). L (No. 11). M (No. 12). N (No. 13). O (No. 14). P (No. 15). Q (No. 16). R (No. 17). S (No. 18). T (No. 19). U (No. 20). V (No. 21). W (No. 22). X (No. 23). Y (No. 24). Z (No. 25). AA (No. 26). AB (No. 27). AC (No. 28). AD (No. 29). AE (No. 30). AF (No. 31). AG (No. 32). AH (No. 33). AI (No. 34). AJ (No. 35). AK (No. 36). AL (No. 37). AM (No. 38). AN (No. 39). AO (No. 40). AP (No. 41). AQ (No. 42). AR (No. 43). AS (No. 44). AT (No. 45). AU (No. 46). AV (No. 47). AW (No. 48). AX (No. 49). AY (No. 50). AZ (No. 51). BA (No. 52). BB (No. 53). BC (No. 54). BD (No. 55). BE (No. 56). BF (No. 57). BG (No. 58). BH (No. 59). BI (No. 60). BJ (No. 61). BK (No. 62). BL (No. 63). BM (No. 64). BN (No. 65). BO (No. 66). BP (No. 67). BQ (No. 68). BR (No. 69). BS (No. 70). BT (No. 71). BU (No. 72). BV (No. 73). BW (No. 74). BX (No. 75). BY (No. 76). BZ (No. 77). CA (No. 78). CB (No. 79). CC (No. 80). CD (No. 81). CE (No. 82). CF (No. 83). CG (No. 84). CH (No. 85). CI (No. 86). CJ (No. 87). CK (No. 88). CL (No. 89). CM (No. 90). CN (No. 91). CO (No. 92). CP (No. 93). CQ (No. 94). CR (No. 95). CS (No. 96). CT (No. 97). CU (No. 98). CV (No. 99). CW (No. 100). CX (No. 101). CY (No. 102). CZ (No. 103). DA (No. 104). DB (No. 105). DC (No. 106). DD (No. 107). DE (No. 108). DF (No. 109). DG (No. 110). DH (No. 111). DI (No. 112). DJ (No. 113). DK (No. 114). DL (No. 115). DM (No. 116). DN (No. 117). DO (No. 118). DP (No. 119). DQ (No. 120). DR (No. 121). DS (No. 122). DT (No. 123). DU (No. 124). DV (No. 125). DW (No. 126). DX (No. 127). DY (No. 128). DZ (No. 129). EA (No. 130). EB (No. 131). EC (No. 132). ED (No. 133). EE (No. 134). EF (No. 135). EG (No. 136). EH (No. 137). EI (No. 138). EJ (No. 139). EK (No. 140). EL (No. 141). EM (No. 142). EN (No. 143). EO (No. 144). EP (No. 145). EQ (No. 146). ER (No. 147). ES (No. 148). ET (No. 149). EU (No. 150). EV (No. 151). EW (No. 152). EX (No. 153). EY (No. 154). EZ (No. 155). FA (No. 156). FB (No. 157). FC (No. 158). FD (No. 159). FE (No. 160). FF (No. 161). FG (No. 162). FH (No. 163). FI (No. 164). FJ (No. 165). FK (No. 166). FL (No. 167). FM (No. 168). FN (No. 169). FO (No. 170). FP (No. 171). FQ (No. 172). FR (No. 173). FS (No. 174). FT (No. 175). FU (No. 176). FV (No. 177). FW (No. 178). FX (No. 179). FY (No. 180). FZ (No. 181). GA (No. 182). GB (No. 183). GC (No. 184). GD (No. 185). GE (No. 186). GF (No. 187). GH (No. 188). GI (No. 189). GJ (No. 190). GK (No. 191). GL (No. 192). GM (No. 193). GN (No. 194). GO (No. 195). GP (No. 196). GQ (No. 197). GR (No. 198). GS (No. 199). GT (No. 200). GU (No. 201). GV (No. 202). GW (No. 203). GX (No. 204). GY (No. 205). GZ (No. 206). HA (No. 207). HB (No. 208). HC (No. 209). HD (No. 210). HE (No. 211). HF (No. 212). HG (No. 213). HH (No. 214). HI (No. 215). HJ (No. 216). HK (No. 217). HL (No. 218). HM (No. 219). HN (No. 220). HO (No. 221). HP (No. 222). HQ (No. 223). HR (No. 224). HS (No. 225). HT (No. 226). HU (No. 227). HV (No. 228). HW (No. 229). HX (No. 230). HY (No. 231). HZ (No. 232). IA (No. 233). IB (No. 234). IC (No. 235). ID (No. 236). IE (No. 237). IF (No. 238). IG (No. 239). IH (No. 240). II (No. 241). IJ (No. 242). IK (No. 243). IL (No. 244). IM (No. 245). IN (No. 246). IO (No. 247). IP (No. 248). IQ (No. 249). IR (No. 250). IS (No. 251). IT (No. 252). IU (No. 253). IV (No. 254). IW (No. 255). IX (No. 256). IY (No. 257). IZ (No. 258). JA (No. 259). JB (No. 260). JC (No. 261). JD (No. 262). JE (No. 263). JF (No. 264). JG (No. 265). JH (No. 266). JI (No. 267). JJ (No. 268). JK (No. 269). JL (No. 270). JM (No. 271). JN (No. 272). JO (No. 273). JP (No. 274). JQ (No. 275). JR (No. 276). JS (No. 277). JT (No. 278). JU (No. 279). JV (No. 280). JW (No. 281). JX (No. 282). JY (No. 283). JZ (No. 284). KA (No. 285). KB (No. 286). KC (No. 287). KD (No. 288). KE (No. 289). KF (No. 290). KG (No. 291). KH (No. 292). 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NB (No. 364). NC (No. 365). ND (No. 366). NE (No. 367). NF (No. 368). NG (No. 369). NH (No. 370). NI (No. 371). NJ (No. 372). NK (No. 373). NL (No. 374). NM (No. 375). NN (No. 376). NO (No. 377). NP (No. 378). NQ (No. 379). NR (No. 380). NS (No. 381). NT (No. 382). NU (No. 383). NV (No. 384). NW (No. 385). NX (No. 386). NY (No. 387). NZ (No. 388). OA (No. 389). OB (No. 390). OC (No. 391). OD (No. 392). OE (No. 393). OF (No. 394). OG (No. 395). OH (No. 396). OI (No. 397). OJ (No. 398). OK (No. 399). OL (No. 400). OM (No. 401). ON (No. 402). OO (No. 403). OP (No. 404). OQ (No. 405). OR (No. 406). OS (No. 407). OT (No. 408). OU (No. 409). OV (No. 410). OW (No. 411). OX (No. 412). OY (No. 413). OZ (No. 414). PA (No. 415). PB (No. 416). PC (No. 417). PD (No. 418). PE (No. 419). PF (No. 420). PG (No. 421). PH (No. 422). PI (No. 423). PJ (No. 424). PK (No. 425). PL (No. 426). PM (No. 427). PN (No. 428). PO (No. 429). PP (No. 430). PQ (No. 431). PR (No. 432). PS (No. 433). PT (No. 434). 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AXE PATTERNS.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXES.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXE PATTERNS.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXES.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXE PATTERNS.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

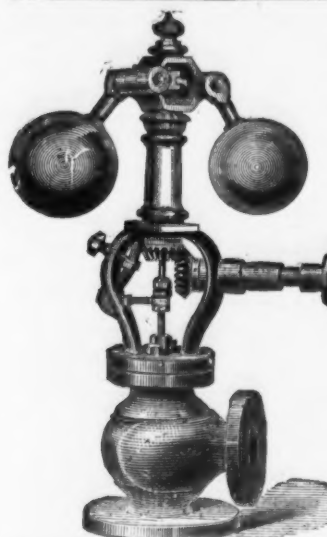
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AXE PATTERNS.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXES.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXE PATTERNS.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

AXES.—No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 5



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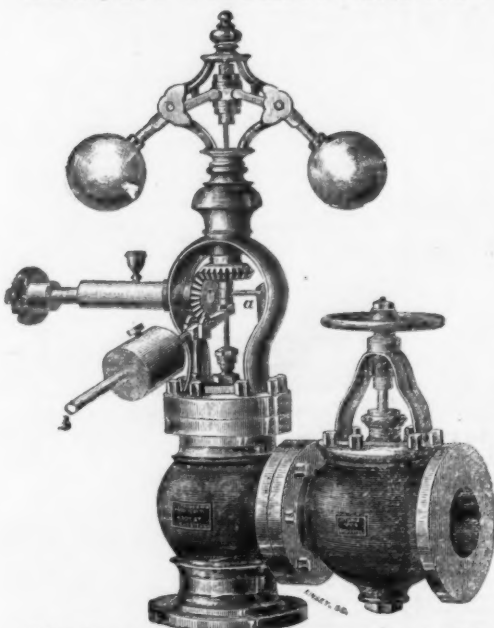
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W. Governors are ordered, be particular and say Governor with Stop Valve, or without Stop Valve; and either Black, Finished or Portable, as you may require, and with or without Lever Attachment. For dimensions and other particulars send for Illustrated List.

Capacity of Valve or Diameter of Steam Pipes in inches.	Price, Black.	Price, Bright-Finish.	Price, Portable.	Price of Lever Attach- ment for altering speed.	Price of Stop Valve.
18 00	20 00	17 00
20 00	22 00	19 00
22 00	24 00	21 00	2 01	5 35	5 25
24 00	26 00	23 00	2 25	6 50	6 50
26 00	28 00	25 00	2 50	8 50	8 50
28 00	30 00	27 00	3 25	11 00	11 00
30 00	32 00	29 00	3 50	13 00	13 00
32 00	34 00	31 00	4 25	15 00	15 00
34 00	36 00	33 00	4 50	17 00	17 00
36 00	38 00	35 00	5 25	19 00	19 00
38 00	40 00	37 00	5 50	21 00	21 00
40 00	42 00	39 00	6 25	23 00	23 00
42 00	44 00	41 00	6 50	25 00	25 00
44 00	46 00	43 00	7 25	27 00	27 00
46 00	48 00	45 00	7 50	29 00	29 00
48 00	50 00	47 00	8 25	31 00	31 00
50 00	52 00	49 00	8 50	33 00	33 00
52 00	54 00	51 00	9 25	35 00	35 00
54 00	56 00	53 00	9 50	37 00	37 00
56 00	58 00	55 00	10 25	39 00	39 00
58 00	60 00	57 00	10 50	41 00	41 00
60 00	62 00	59 00	11 25	43 00	43 00
62 00	64 00	61 00	11 50	45 00	45 00
64 00	66 00	63 00	12 25	47 00	47 00
66 00	68 00	65 00	12 50	49 00	49 00
68 00	70 00	67 00	13 25	51 00	51 00
70 00	72 00	69 00	13 50	53 00	53 00
72 00	74 00	71 00	14 25	55 00	55 00
74 00	76 00	73 00	14 50	57 00	57 00
76 00	78 00	75 00	15 25	59 00	59 00
78 00	80 00	77 00	15 50	61 00	61 00
80 00	82 00	79 00	16 25	63 00	63 00
82 00	84 00	81 00	16 50	65 00	65 00
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90 00	92 00	89 00	18 50	73 00	73 00
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104 00	106 00	103 00	22 25	87 00	87 00
106 00	108 00	105 00	22 50	89 00	89 00
108 00	110 00	107 00	23 25	91 00	91 00
110 00	112 00	109 00	23 50	93 00	93 00
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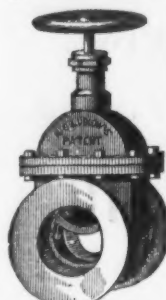
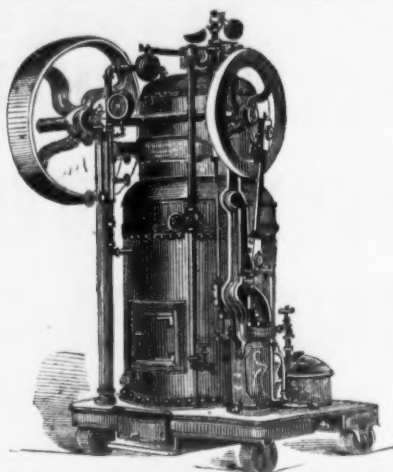
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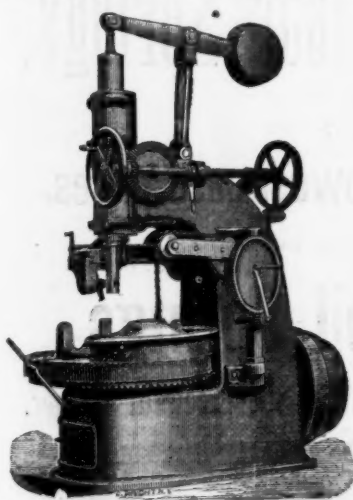
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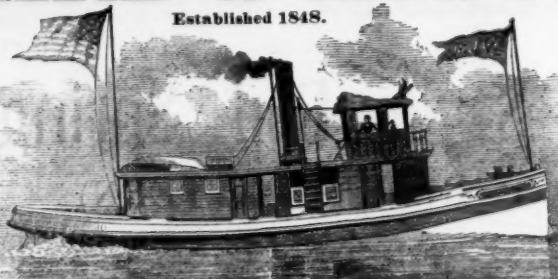
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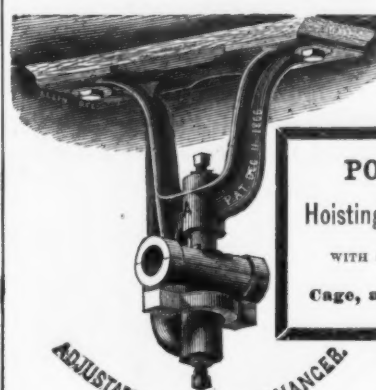
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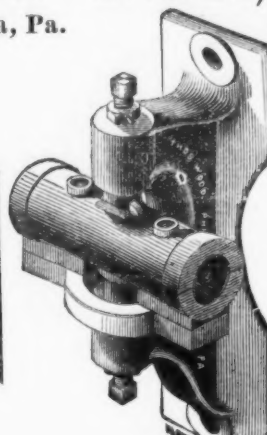


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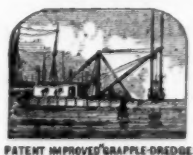
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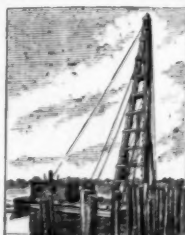
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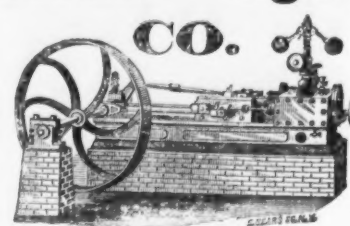
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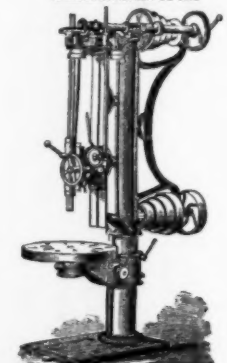
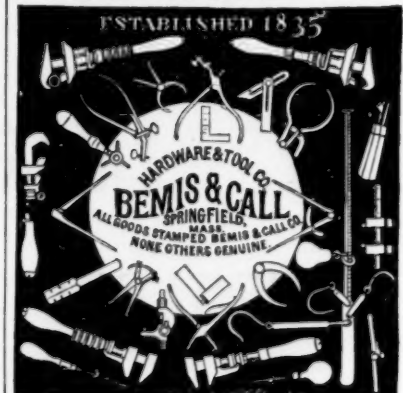
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